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# **The International Military Digest**

## *Annual*

**A Review of the Current Literature of  
Military Science**

*for 1916*

**Cumulated from the Monthly Issues of  
The International Military Digest**

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**CUMULATIVE DIGEST CORPORATION  
NEW YORK CITY  
1917**

War 18.21

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**The International Military Digest**

*A n n u a l*

**1916**



# International Military Digest Annual 1916

A REVIEW OF THE CURRENT LITERATURE OF MILITARY SCIENCE

CUMULATED FROM THE MONTHLY ISSUES OF THE INTERNATIONAL MILITARY DIGEST

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Main entries are indicated by **BLACKFACE CAPS**; subheads by lower case blackface; geographical subdivisions by *italic center heads*.

NOTE.—The digests of articles presented herein are merely condensed statements of the original articles. The Editors assume no responsibility for the opinions or conclusions, which are those of the individual authors. Any editorial comment is enclosed in brackets [ ].

## ACADEMIES, Military

See

SCHOOLS, MILITARY

## ADMINISTRATION, Military

*Portugal*

[Creation of a Division of Officers of Administration. By J. R. Costa, Jr., Lieutenant of the Service of Military Administration. *Revista Militar* (Portugal), June, '16. 3000 words.]

(An argument in favor of establishing a department of administration and assigning officers to it permanently, with a view to relieving officers of the General Staff of the details of administration. One of the principal arguments in favor of it is the economy that would result to the national government. Cites the principal countries of Europe and the United States as examples.)

—War Departments and Ministries

See also

WAR—GOVERNMENTAL CONDUCT OF

AUSTRIA—WAR DEPARTMENT

## AERIAL ARTILLERY

[A Gun that Shoots Both Ways at Once. *Scientific American*, Sept 23, '16. 1200 words. Illustrated.]

For use on aircraft, a gun has been designed which opens in the middle, allowing the insertion of a cartridge with a projectile in one end, a powder charge in the middle, and a load of fine shot in the other end. When discharged there is little recoil. The fine shot thrown to the rear have but a short danger space. A 2-pdr. gun of this design weighs 75 lbs. and throws a 1½-inch projectile with

a muzzle velocity of 1200 f.s. A 3-inch gun fires a 12-lb. projectile with muzzle velocity of 1100 f.s. The practicability and effectiveness of the gun have been demonstrated.

## AERIAL TORPEDOES

See

TORPEDOES—AERIAL

## AERODYNAMICS

See

AERONAUTICS—THEORY OF

## AEROGRAPHY

[Aviation and Aerography. By Alexander McAdie. *Aviation*, Aug 15, '16. 2230 words. 6 illustrations.]

The aerographer is a student of the structure of the atmosphere, one who charts the physical conditions at all levels. This will include all layers up to 15 or 20 kilometers. The first research work of this kind was made by an American naval officer and is published in a book called *Charts of the Atmosphere*.

This work is done principally by kites, manned balloons, sounding balloons, and pilot balloons. The highest levels reached are as follows: kite, 7044 meters; aeroplane, 7404 meters; manned balloon, 10,500 meters; sounding balloon, 37,000 meters; and pilot balloon, 39,000 meters. Most aeroplane work will be done below the 4000 meter level.

The aerographic chart will show mean summer and winter temperature, winds and velocities for each 200-meter level, and departures from these for various hours. Zones of maximum gustiness will be charted as will the distribution of water vapor at all levels.

## AERONAUTICS

[Note, for a rapid survey of the material under AERONAUTICS, that it is distributed on the pages indicated under the following geographical and subject subheads:

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Note also for much other valuable material on AERONAUTICS the cross-references, not only after the General material under this head, but also after the material under many of the AERONAUTICS subheads.]

[Mr. Hammond Estimates our Aerial Needs. *Arms and the Man*. Dec 9, '15. 450 words.]

Discussing with the officers of the Aero Club of America what he had learned in Europe, John Hays Hammond, Jr. said that the greatest lesson for the United States in the present conflict was in the fact that it had been brought about by unpreparedness on the part of the weaker military nations, and that, if France and England had been prepared for defense against Germany, the war would not have been.

Mr. Hammond found that people in Europe could not believe that there was in this country actually some doubt as to the advisability of preparing the nation for defense. When

he told a few of them that in our Army and Navy equipment there were but twenty aeroplanes, they were incredulous and asked if he did not mean two thousand—a natural feeling, since in Europe it is considered that less than 10,000 aeroplanes are inadequate for a first class military establishment under modern war conditions.

Mr. Hammond points to the fact that the number of officers in the French Army has increased since the beginning of the war from 25,000 to 100,000, as showing how essential are officers. He says that we have not enough.

According to Mr. Hammond's estimate, our Army should have 2000 aeroplanes, with 2000 trained observers, and the Navy should also have a large force of aviators.

[The Death Toll of Our Misspent Aeronautic Appropriation. By Eustace L. Adams. *Popular Science Monthly*, Jan, '16. 500 words. Illus.]

(Note. As the title indicates, a highly critical article. Certain statements only are abstracted.)

The Army and Navy together have 50 officer-aviators and only 20 machines. Of the latter, only six are in flying condition. Montenegro has 50 machines and more than 200 aviators.

Due to lack of machines, several of our officers must fly the same machine. One officer,—and none other—should fly a given machine, in order that the pilot may know absolutely the condition of his machine.

[Concerning Aircraft. By Geoffrey De Holden-Stone. *The Army & Navy Gazette*, Oct 9, 1915. 2000 words.]

*Certain Essential Propositions:* This discussion is based on thirteen months of events just past, hence is not prophetic theorizing. We long ago agreed as we sat in the conclaves of speculative indecision and mathematical cocksureness at Whitehall that aircraft had only two functions, strategical and technical reconnaissance; we were only two-thirds right and it is attempted to show that the final third is *active offense*.

So reverting to those other two questions of strategical and tactical aircraft function, let us note the situation as it was in July, 1914, with the three Allies.

Russia then possessed a mixed fleet of about 1000 machines; their condition and fitness for use was incredible, according to the most authentic evidence, i.e., results. This was due to settled convictions in Russian circles that aeroplanes were an ephemeral production, of no probable military value, and like machine guns a diabolic invention. Some of our own high military officials had the self-same opinions and did not hesitate to express and act upon them. England discouraged a popular subscription for military aeroplanes, which France encouraged. In France there was lack of co-ordination in flight practice. Meanwhile German aeroplanes more from thoroughness than from originality of design, mostly inspired from earlier Austrian models, were making long, concerted military flights for hundreds of miles at a



time, by dozens and scores, of at least a half dozen makes.

At such close approach has the fighting been that anything more than tactical reconnaissance has seldom been called for or even possible. Consequently there was no call for any other type of machine than one which could speedily undertake it.

Had France been the aggressor with her army at the Rhine or beyond and invading a peaceful Western Germany, her dependence on these exclusive types would have probably weakened her into sudden delay and possible disaster.

Our own case was no worse, in fact it was rather better, because our inherently vicious basis of development had resulted in three or four makes of perhaps the fastest and most efficient tactical scout machines in the world, such as the Avro and Sopwith "tabloids." Their variety inspired concentration, here and in France, upon certain models. Wastage considerations likewise compelled concentration upon such types as were easiest flown by the average military pilots of speedy training and short experience.

All of the marvellous bomb-dropping and Zeppelin-"strafing" has after all, only been, so to say, an interlude from tactical scouting and rapid survey work. What they have done is an eternal monument of efficiency and valor.

And that is the very reason why we and our Ally stand most in need of warning that we must not depend on types, or anything like them, for any other kind of reconnaissance; and that until we shall have produced in scores and hundreds, an entirely different—and obviously novel—type for strategical reconnaissance as a heavily powered, crew-carrying, armed, fighting cruiser, it will be useless as well as foolish to attempt the "sweeping counter-movement" advocated by and desired of Fleet Street. Pending that development it cannot be done, no matter what new armies, of no matter what splendid material we bring into the field. Thus provided, our victory is certain; without it we only protract the struggle ruinously and indecisively. We are without these machines because of earlier need of the speedy tactical scout. This is why the Zeppelins have not been intercepted and why no counter attack has been attempted in force, even into Essen.

[The Aeroplane of To-day. By Waldemar Kaempffert. *The American Review of Reviews*. Mar. '16. 3500 words. Illust.]

The standing armies of Europe to-day are entirely responsible for the great development of the aeroplane. In the United States, Congress is to blame for the fact that there are so few machines in the American service. If the army had been allowed to exercise its discretion we might, too, have had a thriving industry in air craft manufacture. When the European war came on, orders for machines poured in upon us so fast that they could not be filled; and then a real industry sprang into being. Neither European nor American

builders of flying machines could hope to prosper by collecting money from the promoters of races and country fairs.

The first impetus in Europe came in 1911 during the war between Italy and Turkey. At first Italian conservatives declined to believe that low-flying aeroplanes could give a good account of themselves; and, although a full report of air operations by the Italians in that war has never been published, the aeroplane service of the Italian army was immediately increased, following the experience of the Tripolitan campaign. Whereupon the German and French governments also augmented their air fleets, and all three governments practically assumed charge of the industry in their respective countries.

A year before the outbreak of the present war the boom was at its height. A real industry was established when government appropriations began to be expended for this purpose. The present rush to build aeroplanes may be likened to a stampede to a newly discovered gold field. In the United States we are even building machines under canvas, for want of permanent plants. Curtiss has increased the number of his employees from 150 to 2500, and turns out a machine per day. For the six months ending July, 1915, four million dollars worth of aeroplane material was exported and the export would have been greater had we been prepared.

There are certainly no fewer than 5000 machines now in use in Europe, all of which have been built since the outbreak of the war; and to reach this total no fewer than 50,000 must have been built to keep pace with the losses.

The improvements in design have been no less astonishing. The scientist with his wind tunnel still commands great respect. He alone can smooth out body lines intelligently, improve wing shapes, and increase wind resisting areas.

Before the war it was taken as a matter of course that half the machines entered in an overland endurance test would come to grief before reaching their destination. Now "flocks" of forty or fifty fly for hours; and the only ones that do not return are those brought down by hostile guns. In the last Balkan war aeroplanes did not dare attack each other. Now encounters occur daily. Chavez met a ghastly death in crossing the Alps, yet Austrian and Italian officers fly unconcernedly over the Dolomites to-day. From which it must be apparent to the casual observer that aeroplanes have improved wonderfully.

While no radical departures in construction have been made from the Wright models, architectural rather than mechanical improvements have been made; and it is due to the daring of the early fliers that means have been found to remedy primitive defects. The aeroplane is always a mechanical compromise; what is gained in one way is lost in another.

The boat body has been adopted, after experience, as the best means of enabling the machine to plow on with the least possible disturbance of the air. Each plane, each strut,

**AERONAUTICS—Continued**

each projection leaves a wake of its own. A single wake, permitting the easy flowing together of the air behind a single body, is better. The modern machine approaches this ideal; the old machine raked the air like a harrow. A large correctly designed bulk, enclosing passengers, engines, tanks and steering, slips through the air more easily than an aggregation of irregular shapes.

The improvement in motors is even more tangible. Safety and high speed, over 100 miles an hour, are now attained. A flying machine is a miniature ocean liner; and as horse power is to the latter so is horse power to the former. The aeroplane with 150 horse-power can brave almost any weather. For military purposes a quick maneuvering machine is frequently a necessity. These are usually the monoplane types. On the other hand, a scouting machine, carrying several observers, reserve fuel and rations, etc., must be large: hence the mammoth biplanes and even triplanes. Some of these are real dreadnoughts.

The finest type of large aeroplane constructed in the United States before the present war was the *America*, built by Curtiss for the trans-Atlantic attempt, and sold to England after the outbreak of the war. The mounting of the motors of the machine has been criticised, but foreign construction since has been similar. Curtiss' latest machine is a triplane with 133 feet spread from tip to tip. The *America* had only 72 feet. Four engines with a total of 960 horse-power, a hull with watertight compartments, stabilizers actuated by a 40 horsepower motor, an electric starter, and luxurious living accommodations for a dozen or more persons are the startling features of this monster. While the speed cannot be more than 60 to 70 miles per hour, it can stay aloft for whole days at a time and can land on water or ground. Of course the military value of quick maneuvering is lost in this machine, but the compensating advantages are obvious.

A dependable flying machine is worth from \$8,000 to \$12,000, the price of a racing automobile. Yet its safety is not a matter of absolute certainty, though efforts to improve its military qualities necessarily will improve its peace time security. Mechanism must be invented to enable the machine to leap into the air and to alight, if possible without a run. With these improvements, and others obvious on thought, there seems no reason why the use of the aeroplane cannot become extensive in everyday life.

[To New York by Air in Fifteen Hours. By Claude Grahame-White. *Flying*, May, '16. 1480 words.]

Thousands of air-men are to-day using machines made nearly inherently stable by the use of swept back planes, upturned wing tips, and scientifically designed fins. Aero-motors do not often fail now, and with the multi-motored machine of the future, the risk of a mechanical breakdown will be reduced to the vanishing point. In the future the horse-power

will be reckoned in thousands instead of in hundreds as to-day. A voyager will be able to step into his cabin in London on Friday afternoon and find himself in New York on Saturday morning. The large wing surface necessary to raise heavy loads from the ground is not needed once the machine is traveling rapidly through the air. What is needed is a means of reefing or telescoping the planes. In the craft of the future the planes will be of metal and there will be panels made to slide to and fro so as to give the necessary amount of surface. Science in shaping the hulls will have to be brought to perfection in order to reach a speed of 200 miles an hour. Twenty years hence the air will be peopled by craft, large and small, swift passenger machines, slow goods-carrying machines, grim gray war machines, and aero mails, and as soon as darkness falls there will be flashes of light from signal towers, each route and alighting ground being distinguished by a different color or flash or number of flashes of light.

[Aeroplanes and Zeppelins. *Memorial de Artillerie*, May, '16. 700 words. Abstract from *L'Aérophile*.]

When used for launching bombs against a structure the dirigible has the following advantages:

1. It may approach its target from the windward without making too much noise, since it may creep up with its motor stopped or going very slowly.

2. It may carry a large quantity of projectiles.

3. These may be better directed, since the personnel works on a more stable platform, and, besides, the dirigible may move with very slight velocity or even stop completely and remain directly over the objective.

4. The attack may be organized from a great distance, since the dirigible can remain many hours in the air without the necessity of re-supply.

5. An accident to the motors or the mechanism does not require descent in the enemy's territory.

6. If there is no wind, it may ascend nearly vertically by throwing out ballast.

Its disadvantages are:

1. A modern Zeppelin of 27,000 cubic meters capacity will be weighted by about 1000 kg. from a light covering of moisture amounting to only one-tenth of a millimeter.

2. Dirigibles have great difficulty in operating when the wind is at all strong, in spite of all the devices used to accomplish this purpose.

3. When there is any wind it is not possible to accomplish complete immobility.

The advantages of the aeroplane are:

1. It can move more rapidly and ascend to a greater height than the dirigible.

2. It presents a smaller target.

3. It carries no inflammable gases, and is not exposed to rapid destruction from an explosion.

4. It does not require a large shelter to

protect it from the wind, and it does not need so large a crew as a dirigible.

5. The pilot may fire in any direction, which he cannot do in a dirigible.

The disadvantages of the aeroplane are:

1. It has to describe spirals in order to attain great heights and, consequently, when the presence of a Zeppelin is signalled at times, more than half an hour is required before the aeroplane has ascended sufficiently high to attack the enemy.

2. The operation of landing at night is very dangerous.

3. To launch bombs with probability of hitting the target requires much practice, since the velocity of the aeroplane, its height and the force and direction of the wind have to be taken into account.

[History of the Conquest of the Air. By Henry Woodhouse. *Flying*, July 16, '16. 9950 words. 26 illustrations.]

The first type of aircraft to travel thru the air was the balloon, piloted by two Frenchmen, on Nov 21, 1783.

Before the present European War broke out there were 3000 licensed balloon pilots in the world who made between 7000 and 10,000 ascensions each year.

The first ascension of a dirigible was also made by a Frenchman, on Dec 24, 1852, in a balloon 143 ft. long and 39 ft. in diameter. It made a speed of 6 miles per hour. The latest passenger-carrying dirigible was 490 ft. long, 46 ft. in diameter, and had a gas capacity of 681,000 cu. ft. It could carry from 30 to 40 passengers at a speed of 50 miles per hour for 40 hours. This was a rigid type Zeppelin. The latest non-rigid type could carry 20 men for over 20 hours, and had a speed of 45 miles per hour.

The first aeroplane flight was a straightaway flight of twelve seconds, made on Dec 17, 1903, by the Wright brothers. On Sept 15, 1904, they made the first turn, and on Sept 20 the first circle.

On Oct 17, 1905, the first flight of over a half hour was made; it lasted 33 min. 17 sec. In 1914 the aeroplane records were nearly all broken by Germans, due to the activities of the Aerial League. The endurance record was changed from 14 hours in 1913 to 24 hours and 12 min.; the altitude record from 20,295 ft. to 26,246 ft. One pilot in 21 hours and 49 min. covered 1336 miles, the longest distance ever covered by a man in a day.

At the present time over 9000 German aviators are flying and under training, and about 20,000 aeroplanes are in use for war purposes.

The Admiralties of different nations which have thousands of aeroplanes are apologizing for not being able to get air fleets fast enough to protect their coasts against raids.

The largest aeroplane being constructed will have six 12-cylinder motors of 300 hp. each, and will have a speed of 100 miles per hour with a crew of six people and sufficient fuel, food, etc., for a trip across the Atlantic.

At the present time only 40 or 50 aeroplanes

are being used for utilitarian purposes. Twenty thousand could be used and may be used inside of five years.

There are most difficult problems in transportation in the United States, Canada and South America which the aeroplane can solve most easily and economically. The Post Office Department contemplates using several hundred for mail carrying.

The Coast Guard service can use them to locate derelicts, and either blow them up or stand by and summon aid by wireless.

[The News of the Week. *Aerial Age Weekly*, Oct 2, '16. 1900 words.]

The Navy will soon send out specifications for a dirigible of the Zeppelin type, 500 ft. long. Naval air men made remarkable records with bombs and aeroplane guns at an altitude of 2000 ft. Nine out of twelve bombs hit the target.

The first Hispano Suiza motor made in the United States develops 158 h.p. at 1400 r.p.m.

The Goodyear kite balloon made a trip from Akron, Ohio, to Washington, Ohio, 120 miles, on Sept 23, in three hours and forty-five minutes.

The War Department has entered into negotiations for the purchase of an anti-aircraft gun declared to be the most effective in the world.

Preliminary steps have been taken towards organizing a third and fourth aero squadron in the U. S. Army.

See also

AERIAL ARTILLERY  
AEROGRAPHY  
ANTI-AIRCRAFT ARTILLERY  
BALLOONS  
BOMBS—AERIAL  
COAST DEFENSE—USE OF AEROPLANES IN DIRIGIBLES  
EUROPEAN WAR—LOSSES—AERONAUTICAL  
FIELD ARTILLERY—DEFENSE AGAINST AIRCRAFT  
FIELD ARTILLERY—FIRE CONTROL—AERONAUTIC—KITE BALLOONS  
HANGARS  
FOKKER AEROPLANE  
HYDROAEROPLANES  
HYDROGEN—PRODUCTION OF—FOR BALLOONS  
M. F. P. AEROPLANE  
NAVAL OPERATIONS—AERONAUTICS IN  
NIEUPORT AEROPLANE  
SMALL ARMS—ANTI-AIRCRAFT FIRING  
TORPEDOES—AERIAL  
WRIGHT AEROPLANE  
OTTO BIPLANE

France

[My Experiences as an Air Scout. By Frederick C. Hild, *Sphere*. Mar 25, '16. 2000 words. Illustrated.]

(Mr. Hild was an American aviator accepted as a volunteer by the French government. The article is a graphic account of his experiences. He was associated with some of the well-known French aviators, among them Vedrines and Fournier. The aviators receive the same consideration as the aver-

**AERONAUTICS—Continued**

age French soldier, no more. After a couple of practice flights, Mr. Hild was allowed to qualify for his military license by a flight of one hour and forty-five minutes in an 80 h.p. monoplane. The greater part of this flight was at an altitude of 7200 feet.

He then proceeded to the front by flying. Six machines made a flight of 150 km. without mishap. The first day's work at the front consisted of an hour's patrolling at an altitude of 7,000 feet. Large bodies of German troops were observed in march, but it took 10 minutes circling around and the aid of field glasses to tell which way they were going. A day's work apparently consisted of a morning and afternoon patrolling flight.—(Ed.)

*Germany*

[Aeronautics. German Biplane of Double Fuselage Type. Note. *Scientific American*, Feb 19, '16. 150 words.]

The *Russkoe Glovo* describes a German aeroplane brought down on the northern front. It had two unusually large fuselages and two tails. Each fuselage contained two machine guns and a light quick-firer. Two 170 h.p. engines supplied power. The pilot's nacelle was in the center and below the level of the fuselages, and had armor protection. The crew was six men. The machine described appears to be an improved "Fritz." The latter machine has already appeared on the western front.

[Aeronautics. Low-Flying German Aeroplanes. Note. *Scientific American*, Feb 19, '16. 150 words.]

It is learned that the Germans have introduced into service an aeroplane which flies fast and low, depending upon its speed for protection against anti-aircraft artillery, and upon armor of sufficient thickness to protect against small arms and machine guns. Low flying facilitates accurate observation.

[Nine Thousand German Aeroplanes. *Popular Science Monthly*, Mar, '16. 250 words.]

It is stated that in conversation with a military attaché of one of the South American countries, a high German officer made the statement that Germany had more than 9000 aeroplanes.

It is reported that the German eastern front is manned by few men and many aeroplanes. The latter give ample warning of any Russian movements. The Germans have almost complete control of the air on this front. The Russians need at least 2000 machines to be able to cover the movements of their troops.

[The German Aeroplanes. By Eric Stuart Bruce, M.A., Oxon., F.R. Met. Soc., Late Honorary Secretary Aeronautical Society of Great Britain. *United Service Magazine*, June, '16. 3600 words.]

A sufficient number of German aeroplanes have been captured by the Allies to afford a clear knowledge of the present state of progress in the aeroplane industry of that country.

The German aeroplanes show a remarkable unity of design, a careful elimination of what is not the fittest to survive and a perfecting of those qualities which render them efficient instruments of war. In essence they are devoid of originality, with the exception of the Taubes, a type most unlikely to endure.

It was the aeroplane tests in the French autumn maneuvers in Picardy in 1910 that first aroused the Germans from their illusions that lighter-than-air machines would solve aerial navigation. After these maneuvers, they could no longer concentrate their undivided efforts on their airships, for the French tests showed conclusively the superiority of the aeroplane as an instrument of war. From thence they set to work vigorously to make up for lost time and develop an aeroplane industry, tho they did not abandon the further development of their airships. The rapid progress in German aviation since 1910 is shown by the following data: "In the Imperial Maneuvers of 1911 it was with difficulty that Germany could produce eight aeroplanes; in 1912 she produced eight squadrons; at the end of that year, 230 certificates had been granted to pilots by the German Aero Club; in 1913, the number was 600; in 1912 the number of flying machine manufacturing firms was twenty, while there were fifty in 1913. But when they took to manufacturing aeroplanes in 1910 there was not time to invent largely for themselves. They therefore drew their inspirations from the country that was obviously ahead in practical aeroplane accomplishment, France, relying on their own methodical reputation for working out details to make their borrowed designs worthy of what to the Prussian mind is the Art of Arts, War.

Even the Aviatik and L. V. G. machines, the most powerful of German aeroplanes, are modifications of the French Nieuport type, while the Albatros machines have a striking resemblance to several French forms. There could be no better example of the way Germany has borrowed from France than in the case of the famous French Morane-Saulnier monoplane. The Ago monoplanes were precise copies of the Morane, only differing in that sometimes they had stationary motors. In the case of the Hanuschke monoplane the word "copy" is inadequate. This monoplane was identical with the Morane; it had the same motor, in fact it could not be distinguished from the French machine. Then the Fokker machine is really a copy of the Morane-Saulnier, with certain modifications. The Taube monoplanes are the only ones laying claim to originality. In 1904 Igo Etrich began to construct gliders which depended on gravity for their motive power. He then built motor-driven machines, every year evolving an improved form, until in 1914 he produced the perfected form of Etrich, or Taube, monoplane. In this the tips of the wings were slightly swept back and upturned. The tail was of the hinged elevator type, and had a partially balanced rudder and vertical fin above it.

The following is the list of aeroplanes that were available at the beginning of the war:

*In the Military Service*

Biplanes: Albatros, Albatros Bréguet, A. E. G., Aviatik, Bréguet, Bristol, D. F. W., Euler, L. V. G., Otto, Wright.

Monoplanes: Albatros, Aviatik, Bristol, D. F. W., Dornier, Fokker, Gotha, Harlan, Jeannin, Rumpler.

*In the Naval Service*

Biplanes: Ago, Albatros, Avro, Curtiss.

Monoplanes: Rumpler.

The necessities of war soon weeded out the unfittest and modified the details of those types which were allowed to survive. The Germans put forth a large number of the Taubes at the beginning of the war, as they considered them simple, strong and stable. The latter quality they certainly possessed, but they were found wanting for reconnaissance uses, and were ill-adapted to be weapons of offense. They soon came to the same conclusion as other nations, that for military use biplanes are superior to monoplanes and now rely chiefly on the former, the exception is made in the frequent use of the fighting Fokkers. Tractor biplanes, those which have the screw in front, are now almost universally used by them, and these are provided with fuselages so covered in that every source of extra resistance can be eliminated. The length of the Taube has gradually been reduced to 8 m., and even 7m.75 in the case of the Albatros machine, tho the latter sometimes had a span of 16m.10. All the German aeroplanes now have short fuselages with very large stabilizing planes at the back, and in all the recent types ailerons are used on the upper planes for maintaining lateral stability instead of the Wright system of flexing the main surfaces. Also the upper and lower planes are invariably equal in width. Formerly the color of the German planes was light yellow; now the wings and the covering of the fuselage are white, being treated with a colorless transparent varnish. At present the rudder for controlling the vertical movements consist of two semi-oval flaps hinged to a fixed stabilizing plane. The rudder for horizontal steering is generally also semi-oval. With the exception of the Fokker machine the Germans are very constant in their use of stationary engines. All the German biplanes and one of the Fokker monoplanes are double-seated machines, while the aeroplanes which have two motors generally have three seats. The relative position of the pilot and observer are not the same in various types. It is interesting to note that they have abandoned dual control in their machines.

Great attention has been paid in Germany to the methods of mounting machine guns on aeroplanes. In the Aviatik of the latest type, the machine gun is moved rapidly along two parallel steel bars outside the two edges of the fuselage. Two catches in front prevent the line of fire coming within range of

the propeller. In the L. V. G. the machine gun is mounted on a rotating apparatus on which it can be rapidly turned around. The passenger, who is seated behind in this machine, can fire from behind, in any direction, and to some extent in front, upwards or downwards.

[Modern German Aeroplanes. By Jean Lagorgette. *Aviation*, Aug 16, '16. 1340 words. 6 illustrations.]

The German aeroplanes have tended more and more toward uniformity. The giant machines so often heard of are seldom seen along the battle front. The distinctive feature of a German aeroplane before the war was the sweep back of the planes, but this has disappeared in the more recent machines. The typical German machines are tractors and are either wholly or in part copies of successful machines of foreign make. The fuselage is much shorter and the stabilizing planes much larger in their machines than in those of other nations. The wings are nearly rectangular in shape, with both the upper wing and lower wing the same length. Ailerons are used on all types, and nearly all have a slight dihedral, and metallic struts are common. The typical landing gear consists of a simple "V" chassis with rubber shock absorbers, and is mostly of metal construction. Dual controls are seldom used.

[German Army Aeroplanes. *Army & Navy Jour.*, Oct 28, '16. 500 words.]

Types of German aeroplanes are described by a writer in *L'Aérophile*, based upon captured machines.

The giant machines are seldom seen on the western front. In addition to the well-known Taube, there are in use Aviatik, Albatross, and Fokker machines, more or less copies of French machines. The Germans favor the tractor type and use short bodies with success. The present average length is 26 feet. Ailerons are used on all types.

Interplane bracing is much reduced, eight metallic struts with rectangular wiring being used in recent types. The connection between fuselage and upper wing is through a pair of inverted V supports. The wings are of yellowish cloth doped with a transparent bluish varnish.

The simple V chassis landing gear is used, with rubber shock absorbers. All German biplanes use 6-cylinder fixed motors. All machines have two seats in tandem, either passenger or pilot sitting in front. Dual control is not employed, being of the usual wheel and foot bar types.

*Great Britain*

[The Air Service Debate. *The Army & Navy Gazette*, Feb. 26, '16. 1000 words.]

The debate on the general efficiency of our Air Service began last week and has continued with small and insignificant intervals ever since. The Lower House was very much in

**AERONAUTICS—Continued**

earnest and had more or less to say about the recent Zeppelin raid across England; they did not ask so much for defense against a repetition of this sort of thing as they did that the Air Service should be put on a proper footing; that it should no more be regarded as a handmaid whose duties were divided between the Army and Navy; but that it should be a distinct arm to be looked after and fashioned for offensive warfare of a very special and novel kind. It was pointed out that through error or bad judgment we had refused to have anything to do with airships of the rigid type, and had only agreed as a sort of "sop" to the British public to have any airships at all. Three Ministers, one after another, protested that it was impossible effectively to protect all cities of the country from air raids. One, when pressed in the matter of responsibility for defense against aircraft, stated that the Admiralty had been charged with all defence matters, but were in the process of turning them over to the War Office; Sir Percy Scott had neither left the Admiralty nor joined the War Office, but was in the process of doing both; and all these mystic maneuvers were somewhat inaptly described by Mr. Tennant as a reform. Referring to another raid on one of the south coast towns, Mr. Tennant stated that the Admiralty was then in charge of the defence—the transfer was then incomplete—as the aeroplanes to meet the attack were furnished by the War Office, that a pilot actually ascended though his machine was probably unarmed, as the squadron to which it belonged was not yet armed. Under the circumstances it is probably just as well that our aeroplane did not overtake the German machine.

The debate in the Lords did not supply any elucidatory matter. Lord Kitchener said "the construction of anti-aircraft guns has now priority over other ordnance, and as fast as these guns are produced by the Munitions Department they will be distributed to the best advantage throughout the country."

We hope Lord Kitchener has been wrongly reported or else said something that he did not mean; it would be a terrible thing if a more or less imaginary fear at home reduced the supply of ordnance to our many "fronts" where it is urgently needed. We were late in entering on the construction of aircraft, "an excellent thing," once said a War minister "since it permitted of our profiting by the experience of others;" what we have to do now is to make up for lost time and provide ourselves with high-powered machines of the latest design.

Rather than await the Zeppelins in this country, let us attack their bases and sheds in Germany and Belgium, but under no circumstances must we resign any military advantage we have gained in France with aircraft by using them for purely protective purposes in this country. The debate has cleared the air and has shown us and our enemies that we are not alarmed at the German air-raiders, and has convinced our Ministers that we are

as anxious to be supreme in the air as throughout the Nation's history we have been at sea.

[Air Administration. *The Army and Navy Gazette*, London, Apr 1, '16. 1300 words.]

The two air raids in Belgium and Schleswig-Holstein coming so soon after the speeches of Colonel Churchill and Mr. Pemberton Billing are regarded as the response of the government to the fillip thus given. The cabinet again shows itself responsive to the general desire of the people. This agitation may result in the appointment of an Air Minister. The powers of the Derby Committee should be enlarged, to include policy, research, design and supply, but the executive control of seaplanes and aeroplanes should be left with Jellicoe and Haig in their respective spheres. Lord Sydenham proposed an air board organized on the lines of the old board of ordnance. He considers the appointment of the Derby Committee as a halting step, as this committee has no real powers. Lord Sydenham also thinks the air service must be able to act as a separate arm under direct orders of the government. This appears to be in conflict with his view that after the aviators have had their technical training they must be turned over to the navy or to the army to learn their duties as a necessary adjunct of a fleet or army, as the case may be.

[Air Defense Problems and Fallacies. *The Failure of the Derby Committee*. By F. W. Lanchester. *Land and Water*, Apr 20, '16. 4100 words.]

The question of the supply of material is said to have caused the failure of the committee. Trouble over material is not peculiar to the air service. It manifested itself shortly after the outbreak of the war and led to the creation of a Ministry of Munitions and the appointment of a Cabinet officer to organize and regulate supplies.

As an alternative to the committee, the creation of an air ministry with full executive powers is proposed. This proposal requires study from the two points of view by which any scheme of military or naval reform is dominated: the question of responsibility, and that of supply.

It is an axiom that the responsibility of a commander-in-chief for the employment of the forces allotted to him for military operations must be absolute. Another axiom is that in the supply of matériel and personnel, full responsibility must rest with the Admiralty and War Office, respectively. As the resources of the country are now being utilized to the utmost, it has become one of the most anxious duties of the ministry properly to allocate the resources between the authorities who are responsible. The present conditions are without parallel in national experience.

If the question of the great war had been studied closely by competent authorities on the outbreak of war, every man could have had his duties allotted to him. It is hardly probable that the ministry would have dreamed of devoting time and energy to any such hy-



pothetical study. No study was made, therefore, and the government had to improvise methods. The Army and Navy have competed for the output of the same factory. Industrial firms and recruiting officers have competed for the same men.

The responsibility of the War Office and the Admiralty has had to be subject to the regulation of the Ministry of Munitions; the latter is a makeshift, its powers and scope being determined as a matter of expediency rather than of logic.

The air service has suffered seriously from the difficulties of supply; especially so with reference to special matériel such as aeroplanes, motors, anti-aircraft artillery, bombs, Lewis guns, etc. The popular cry that the Army and Navy Air services "over-lap" and must be amalgamated into a national air service independently controlled is based on fallacious views. If carried out *in toto*, it infringes absolutely the axioms laid down and can only result in confusion and the "evaporation" of responsibility. The slogan "One Element, One Service" has no national foundation in fact.

An exclusively military operation can take place anywhere in the length and breadth of a continent. It is only when the naval operations affect a coast line or the military operations stretch to within range of naval guns that the two Services are required to act in conjunction. The employment of the two independent services under their respective ministerial heads is clearly appropriate.

There is no analogy to this in the air service. There is no place in the field of military or naval operations where aircraft cannot co-operate. The coast line of the air is the surface of the earth and the surface of the sea. The divorcing of the air service from the other arms, with the resultant division of responsibility, would be considered an absurdity by every military officer of experience and every strategist or tactician of repute.

[Air Defense Problems and Fallacies. By F. W. Lanchester. *Land and Water*, Apr 27, '16. 2300 words.]

(Methods of control, use and administration of the British Air Services are discussed under the captions "Home Defense," "Air Ministry or Board of Aeronautics," "Dual Responsibility," and "Our Second Line of Defense." The difficulties of the problems confronting the government are outlined, no definite conclusions are arrived at. Precipitate action to satisfy popular outcry is warned against.—Ed.)

[Air Problems and Fallacies. Air Ministry as Board of Aeronautics. By F. W. Lanchester. *Land and Water*, May 4, '16. 2500 words.]

The case for an Air Ministry depends mainly upon considerations relating to operations of indirect military value, these operations being broadly divided into home defense and

raids on the enemy. Operations of indirect value are contrary to admitted principles of strategy.

The present blockade of Germany has for its object by the general weakening of the Central Powers to render their offensive less dangerous and their power of resistance less formidable. There is this inherent weakness in the method. Our government begs for economy; what is the response? Reports show a per capita increase in the consumption of bread and of meat, the cheap jewelry trade is booming, the pianoforte trade cannot produce supplies fast enough, and picture palaces are reaping a golden harvest.

Germany knows well the importance of economy. The German Government orders the people to economize. The British blockade enforces the order.

From the point of view of immediate politics, the scheme for an Air Ministry fails on the following counts:

(a) As a defense organization, it would involve a division of authority with the existing services, with attendant "evaporation" of responsibility.

(b) For offense, it is open to criticism on the ground that operations of indirect military value violate the strategic principle of concentration of purpose.

(c) Its powers cannot be extended to include operations of direct military value without clashing with the plenary responsibility of naval and military commands.

(d) Naval and military demands have first claim for personnel and matériel. The scheme cannot be carried into execution during the present condition of shortage.

[Aviation, Present and Future. By Montagu of Beaulieu. *Edinburgh Review*, July, '16. 5500 words.]

Recent criticism, whether merited or not, has stimulated both the Royal Naval Air Service and the Royal Flying Corps to a marked degree, and produced many signs of improvement. There was an investigation of the Royal Aircraft Factory at Farnborough by a committee of eminent men (Sir Charles Parsons, F.R.S., Sir Frederick Donaldson, and Sir Richard Burbidge), and the report was far from complimentary.

Now the attitude has changed. Manufacturers find their views welcomed, and large orders have been distributed to the trade. Thus criticism has justified itself. Zeppelins (five were seen hovering around at the Jutland battle) were of great service to the German fleet, and undoubtedly guided and made good the retreat. One British seaplane was used with striking success, but the advantage was greatly with the Germans. A reversal of the situation might easily have led to the destruction of the German fleet. In anything like moderate weather, the Zeppelins are on the watch from the south of Norway to Borkum. The British public is delighted at the occasional destruction of a Zeppelin, but Germany is building them at the rate of three a month, and probably has

**AERONAUTICS—Continued**

well over forty now in service.

The radius of action of Zeppelins is governed by the gas-holding capacity, and the fuel and oil carrying capacity, the latter based upon seven pounds per mile flown. The theoretical limit is 2000 miles, and certainly it is practicable in favorable weather to make 1500 miles. The whole of England and France are thus commanded. A renewal of naval activity may be expected at any time that favorable weather conditions prevail. The Royal Flying Corps is now being investigated by a committee. The public has apparently already reached a verdict in the matter, and a favorable verdict by the committee would carry little weight.

The effect is to distract attention of officials from the work of their departments to a defense of their own conduct. Mistakes are inseparable from progress. The criticisms of the flying services, which began in the autumn of 1914 and reached a climax in the spring of 1916, have, on the whole, produced good results. The question now is whether the military aviation program is sufficient. There are not enough airplanes at the front today to do the work without overstraining men and machines. More pilots are being trained, but there is a difficulty. Many things that ought to be done deliberately must in war be done hurriedly. In two years the work of training pilots should have been better organized. The attempt is made in three or six months to produce qualified pilots having a fair grounding in military history, tactics, meteorology, engine construction (many types), geography, compass and map-reading, army organization, observation of trenches and fortification, photography, wireless telegraphy, artillery observation, use of machine gun, theory of flight, and a certain amount of drill. Something might be gained by teaching certain subjects to all and specializing on the remainder. The method of selecting candidates should be modified so as to provide for local scrutiny instead of application at the War Office.

The Royal Aircraft Factory has been criticised. It has made mistakes and persisted in them. There is a danger that the "interests of the public service" may not allow the report to be made public.

Some believe that for financial reasons the air service will be severely retrenched after the war. But aerial warfare is cheap, compared with other forms, and 3000 aeroplanes can be built for the cost of a dreadnought. We must have coast stations and anti-aircraft guns with a vertical range of 20,000 feet.

There is discussion as to whether there should be a government aircraft factory. Experience shows that private builders do work as well as, or better and at less cost than, government factories. Private factories are also capable of rapid expansion and are less liable to perpetuate errors. The Royal Aircraft Factory engines are heavier per horse-

power and thirstier for petrol than any other well-known air-cooled engine on the market.

The future of aircraft may only be guessed. Time of transit to India, South Africa and to America will be very greatly shortened if long overland and oversea flights become regularly practicable. Such journeys would be subject to some irregularities, due to weather conditions, but ocean voyages are so affected even now.

[Progress in Aeronautics. By Major H. Bannerman-Phillips. *United Service Magazine*, Sept, '16. 4400 words.]

(Discussion of the functions of the Royal Aircraft Factory and the report of a committee on the same.)

The report of the committee concerning the functions of the Royal Aircraft factory shows that instead of being a factory, as the term is usually understood, working on strictly commercial lines, and therefore being concerned with a maximum output of the finished article—in this case heavier-than-air machines—it is intended to be a huge laboratory where experiments are carried out to full scale. It differs essentially from an industrial concern in that it has no shareholders' interests to consult in the matter of profits on sales, and the taxpayer supplies both capital for plant and buildings, raw material, and salaries and wages of the individuals employed. Its expenses, therefore, are not restricted by commercial considerations; the methods which it employs are sure to be more costly than those of an industrial firm. The committee report that the only manufacturing work done since the war seems to have been an output of about fifty non-experimental machines, and the manufacture of spare parts to meet urgent demands. Commercial aeroplane firms are encouraged to manufacture the government planes.

The committee finally made the following suggestions, among others: The formation of a Board of Management for the factory, to consist of a Chairman or Director, two Superintendents, one of Designs and another of Manufacture, and a Military Adviser, the latter without distinctive executive duties, the last three to have equal rank on the Board; the appointment of a civilian of high standing and suitable qualifications as Controller of Aircraft Supplies, who would have his headquarters in London, and have among his duties direct communication with contractors and the Royal Aircraft Factory.

*United States*

[Note. *Army & Navy Jour.*, Jan 29, '16. 200 words.]

A Burgess seaplane purchased by the navy is to be tested at Pensacola. The requirements are: speed, 80 m.p.h.; climbing capacity, 2500 feet in ten minutes; carrying capacity, 1000 lbs., exclusive of the weight of the machine, comprising pilot and passenger, tools and instruments (or bombs), and 400 lbs. fuel and oil. The latter items are sufficient for four hours' run.

[What Our Flyers are Asking. *Army & Navy Jour.*, Feb 5, '16. 800 words.]

Before the House Military Committee, the Chief Signal Officer stated that, including the 23 officers and 5 enlisted flyers of the Signal Corps, there were only 358 licensed air pilots in the United States. The army has but 25 machines, though the factory capacity is 20 a day, of the Curtiss factory alone ten. Hence the machines could be obtained readily. A much-augmented flying service is needed. Aviators require six months to train. Machines cost \$10,000, with \$5000 additional for upkeep. Their useful life is about one year.

The needs of the aviation section are (1) more money for equipment; (2) additional officers and men; (3) change in the law regarding age limit and against detaining married men; (4) funds for experimental purposes; and (5) a reserve flying corps and aviation training for National Guard officers.

[Inferiority of American Aeroplanes. Note. *Scientific American*, Feb 19, '16. 150 words.]

Lieut. J. E. C. Scott, a British aviator now in this country on official mission, states that not a single aeroplane made in the United States is capable of the service demanded at the front, nor is there a motor made in this country capable of the service required by the Allied aviators. He attributes these shortcomings to two causes—carelessness in manufacture, and ignorance of the requirements of the military aviation service.

[The Aerial Needs of The United States. By Alan R. Hawley, President, Aero Club of America. *Arms and The Man*. April 6, '16. 1300 words.]

Although the aeroplane, the hydroplane, and the flying boat were developed by Americans, and although the United States was the first country to have an aeroplane in its Army and a hydroplane in its navy, we now find ourselves without any organized air service to meet an emergency. Our artillery is without aerial spotters. Our possessions are without aerial protection, with the exception of the entirely inadequate personnel and equipment in the Philippines. The Army and Navy have no dirigibles, observation balloons, or kites.

A few years ago a war might have been waged along our seaboard without affecting the interior of the country; but the aircraft makes every place an aerial port and every place becomes a target to the enemy's aerial bombs. Huge flying boats are being built, which will be capable of crossing the Atlantic. The ocean will probably be crossed within two years, and within ten years our shores will be exposed to aerial attack.

The country needs a Department of Aeronautics. Germany established such a department in 1913, when the Reichstag allowed \$35,000,000 for aeronautics. England is this year spending \$1,000,000,000 and France \$66,000,000 for their air services, but neither country saw the necessity for the establish-

ment of a separate department until after the beginning of the war, and then found it very difficult to find competent authorities to form a staff capable of directing the work.

A Secretary of Aeronautics would solve the aerial problem quickly by co-ordinating the resources of the Army, Navy and Militia, and hastening the development of a Coast Guard Aerial Corps, of the project to carry mail by aeroplane in various localities, and of registering and mobilizing civilian aviators and private owners of aeroplanes, so that their services and machines would be available in case of war.

[Aeroplanes in Mexico. *Army & Navy Register*. April 1, '16. 250 words.]

The aviation problem in connection with the expedition into Mexico has shown the necessity for the possession of 2 squadrons of 12 aeroplanes each, with a replacement of 50% of spare parts. In addition, there must be 22 motor trucks with each squadron.

The type of aeroplane desired is one that will have great carrying capacity, so that an additional supply of gasoline may be carried, sufficiently large to minimize the chances of having to alight in unfriendly territory. Such a machine has been developed in Europe, due to the increased power of anti-aircraft guns. These are now making hits at heights of 14,000 ft.

The idea is not to get the 24 machines at once, but to purchase 8 for experiment as to the best type.

[Aeroplanes Purchased for the Army. *Army & Navy Jour.*, Apr 1, '16. 800 words.]

Recent emergency legislation by Congress provided \$500,000 for aeroplanes, their maintenance and repair. Orders have been placed for four Curtiss and four Sturtevant aeroplanes, at a cost of about \$8,000 each. Twenty-four in all will be purchased, the remaining number under bids. The aeroplanes already purchased have engines of 150 hp., carry pilot and observer, and gasoline for four hours. The first will be delivered on the Mexican border in about two weeks, but some not until about April 30. The machines ordered are similar to those which have been shipped to the Allies, and have given good service. The speed is 80 to 90 m. p. h. and fuel endurance 500 miles.

[Reorganization of Aviation Section. *Army and Navy Jour.*, Apr 15, '16. 500 words.]

In his appearance before the House Committee on Military Affairs the Secretary of War proposed to reorganize the aviation section "by addition and not subtraction." Lieut. Col. G. O. Squier will return from duty as an observer in Europe to take charge of the reorganization. An appropriation of \$1,785,000 was asked; \$600,000 on hand will be used to buy 32 new machines. A board will be appointed to test aeroplanes. The government will not undertake to manufacture aeroplanes. The secretary said that in Mexico at one time only two of eight aeroplanes were in service,

**AERONAUTICS—Continued**

but six were in operation at the present time. Our aeroplanes are not armored, being intended for scouting only.

[Note. *Army and Navy Jour.*, Apr 29, '16. 300 words.]

The first four new aeroplanes sent to the force in Mexico were 90 h.p. Curtiss machines, the same type as the army already had. They were the only ones available for immediate delivery. Four 190 h.p. Curtiss biplanes are now on their way to the border, four Sturtevant 160 h.p. machines are ready for test, and the purchase of another lot of four 160 h.p. Curtiss machines has been authorized.

[Our National Advisory Committee for Aeronautics. Editorial. *Scientific American*, May 13, '16. 900 words.]

The first annual report of this committee has appeared. The greater part of the bulky document is made up of official and unofficial reports on various kindred topics, such as aviation wires and cables, their fastenings and connections (Roebeling Sons Co.); relative worth of improvements in fabrics (Good-year); balloon and aeroplane fabrics (U. S. Rubber Co.); the behavior of aeroplanes in gusts (Mass. Int. Tech.); Pitot and Venturi tubes and other forms of anemometer; meteorological relations of aeronautics; and a voluminous memoir by Prof. Lucke, Columbia University, on Thermodynamic Efficiency of Present Types of Internal Combustion Engines for Aircraft.

A plea is made to Congress for funds for future work, of which the problems are many. So far, only the Massachusetts Institute of Technology and the University of Michigan offer regular courses of instruction and experimentation in aeronautics. The advisory committee deserves liberal support from the government.

[New Army Aviation Equipment. *Army & Navy Register*, Apr 29, '16. 600 words.]

The first aero squadron has been furnished four N-8 type 90-horsepower Curtiss aeroplanes to replace the J-6 90-horsepower machines worn out during the recent activities in Mexico. Four R-2 type 160-horsepower Curtiss machines are now on the way to the border for issue to the squadron. When they are received, the four N-8 machines will be held in reserve. The British have reported very favorably on the performances of the J-6 and N-8 Curtiss machines at the Dardanelles and in Mesopotamia, but the more powerful R-2 type is needed in Mexico to meet the more exacting requirements of long-distance reconnaissance necessary in that country.

The signal corps has just issued standard specifications describing the design, construction, equipment, and requirements of a military aeroplane adapted to land reconnaissance, which prescribe a two-place tractor biplane, with one fuselage, equipped with one 125-

horse-power motor, and capable of carrying a pilot, a passenger, instruments and equipment, and supplies necessary for a flight of six hours duration.

[The Inner Trouble in the U. S. Army Air Service. By Alan R. Hawley, Pres. Aero Club of America. *Flying*, May, '16. 2160 words.]

Each year the Secretary of War and the Chief of Staff have had, very unwillingly, to cut down their estimates for aeronautics to conform to the administration's policy to spend for the army this year no more than was spent last. Although the international situation was alarming in 1915, the order went out to confine the estimates to the figures of the preceding year, and with it a warning that if they exceeded it the Democratic party would be defeated in 1916. A special plea for increase in appropriation for aeronautics was defeated for the reason that the aviation service would then get a larger appropriation than the Signal Corps proper. That would make the Signal Corps an adjunct of the air-service, and they could not be separated on account of the expense. Secretary Baker has predicted such separation and the addition of armored aeroplanes to the U. S. air fleet. Army and Navy aeronautics have been victimized many times by politicians who present alluring plans and then see that no funds are appropriated to carry them out. To improve the air service: (1) Separate it from the Signal Corps; (2) Equip two aero squadrons, allowing three aeroplanes for each aviator; (3) Establish six training schools for training 200 aviators. Each station should have about 1000 acres of ground; (4) Provision should be made for equipping about eight aero squadrons.

[Aeronautics. More Powerful Aeroplanes for the Army. *Scientific American*, May 20, '16. 100 words.]

Orders have been placed for four 160 h.p. Curtiss biplanes, subject to test. The speed will be as high as 95 m.p.h. The new machines are larger and of greater lifting power than the old 90 h.p. machines.

[Note. *Army & Navy Jour.*, June 10, '16. 250 words.]

The War Department (U. S.) has let contracts for twelve new Sloane type tractor aeroplanes. The engines are to be of 125 h.p. They are said to be of the same pattern that the British Government is using for the defense of London. The machines will be delivered one each week after June 21, and will be sent to the Mexican border for service.

[Army Aviation Notes. *Army & Navy Register*, June 24, '16. 500 words.]

Trouble has occurred with the propellers of the twelve 160 h.p. Curtiss aeroplanes recently issued to the 1st Aero Squadron at Columbus, N. M. No propellers have been found strong enough to stand the strain due to such powerful motors. Two, three, and four bladed propellers are being tried under the

supervision of experts. Wood is used. Germany alone has a satisfactory metal propeller.

The Chief Signal Officer has recently ordered twelve Sloane 130 h.p. aeroplanes, the first to be delivered June 26.

Six Martin 90 h.p. machines have been ordered for training purposes, also two Martin 130 h.p. hydroaeroplanes for the Philippines. Two-engined 180 h.p. types will be tried, the distribution of power being expected to solve the propeller problem.

[Thirty Aeroplanes Ordered in One Month. *Aerial Age Weekly*, June 19, '16. 540 words.]

Orders for twenty aeroplanes have been placed by the War Department during the past week, making the total of aeroplanes ordered during the past month thirty.

The order to the Curtiss Co. for enough machines to equip the 1st Aero Squadron has been followed by orders for eight Martin biplanes and twelve Sloan biplanes.

The Chief Signal Officer testified before the Military Committee that the United States Army needed 600 aeroplanes. The appropriation for aeroplanes alone should be \$3,200,000. This would provide \$400,000 for each of the eight aero squadrons authorized.

[The News of the Week. *Aerial Age Weekly*, June 19, '16. 2200 words.]

It is proposed to consolidate the Wright Co. and the Curtiss Aeroplane Co., thus forming a new corporation with an authorized capital stock of \$30,000,000. In February the Curtiss Co. took over the stock of the Burgess Co. The consolidation will terminate the patent litigation now pending between them.

The Navy Department has been conducting experiments for many months for the purpose of developing a steam engine suitable for aeroplanes. An improvised plant, consisting of a boiler and a steam turbine, has been tested.

[The Aero Club of America's Energetic and Constructive Work to get Substantial Air Service for Army, Navy, and Militia. *Aerial Age Weekly*, June 26, '16. 2700 words.]

The executive committee of the Aero Club of America outlines the following things to be done to develop the aerial defenses of the United States:

(1) The appropriation of \$3,222,000 for Army Aviation should be increased to \$5,000,000, the amount required to organize, equip, and maintain five aero squadrons for one year.

(2) The appropriation for training the National Guard officers should be increased from \$76,000 to \$1,000,000.

(3) The estimate for aeroplanes and equipment to be supplied to the National Guard should be increased to \$2,000,000.

(4) The Army needs dirigible balloons and kite balloons.

(5) Provisions made whereby civilian aviators who can pass army tests become part of aerial reserve.

(6) The sum of \$3,000,000 allowed for dirigibles, kite-balloons and stations.

(7) Provisions made for establishing chain of aerial coast patrol stations.

[The Twin-motored J. N. for the Army. *Aerial Age Weekly*, June 26, '16. 550 words.]

The twin-motored 160-h.p. battle plane presented by the Aero Club of America to the New Mexico National Guard has been taken over by the army. This machine, a few days ago at Columbus, climbed 3000 ft. in eight minutes, and 9000 ft. in thirty minutes with full load. As the start was made at an elevation of 4000 ft., the machine is exceptionally efficient.

[News of the Week. *Aerial Age Weekly*, July 3, '16. 2000 words.]

The War Department has ordered fourteen high-powered aeroplanes at a cost of \$275,000 for service on the Mexican border. These machines were ordered from the Sturtevant Co., The Thomas Co., The Curtiss Co., The L. W. F. Co., and The Martin Co. The Deperdussin control has been adopted tentatively as the standard army control.

A plan for developing aviation has been adopted, which contemplates obtaining reserve army aviators from civilian and National Guard aviators, standardizing motor shafts, propellers and other aeroplane accessories, and the establishing of a government corps of inspectors for use in the various factories.

[News of the Week. *Aerial Age Weekly*, July 17, '16. 2750 words. 3 illustrations.]

The 1st Aero Company, N. G., N. Y., was mustered into the federal service on July 13. This company has forty-two men on its rolls, eight of whom are qualified pilots. The company owns four aeroplanes. It is now in camp at Garden City.

The Aero Squadron of Kansas City, part of the Missouri National Guard, has been organized, with 105 members.

[News of the Week. *Aerial Age Weekly*, July 17, '16. 3750 words.]

The first aerial squadron of the United States central aviation reserve organized in Chicago as follows: Company "A," hydroaeroplanes; Co.'s "B" and "C" land machines. The organization starts with twenty-four aviators.

The Goodyear Rubber Co. has presented a fully equipped kite balloon to Battery "B," Ohio field artillery. This balloon is the latest development in kite balloons.

A radio message was received from an army aeroplane which was twenty miles away, and at an altitude of 5000 feet at San Diego. The radio is being developed by Captain Culver.

A small monoplane, Canard type, has been successfully demonstrated at Los Angeles. Its principal dimensions are: Span, 18 ft.; length, 16 ft.; weight, 230 pounds. A motor-cycle engine is used.

[Army Aviation Notes. *Army and Navy Register*, Aug 19, '16. 400 words.]

**AERONAUTICS—Continued**

Favorable reports come from the first aero squadron concerning the twelve R-2, 160 h.p. Curtiss aeroplanes. Trouble from breakage of propellers has been largely obviated. A metal propeller is being developed. One of the six Curtiss twin-propeller, 180 h.p. aeroplanes has been delivered at Columbus, N. M., and given preliminary trial. A second aero squadron is to be organized at San Antonio, Tex.

See also

**AERONAUTICS—USE OF WITH MEXICAN EXPEDITION, 1916**

**—Altitude Records**

[Aeronautics Records. *Information*, Dec, '15.]

"Lieut. Zanni, an Argentine military aviator, on Nov 20, at Buenos Aires, made what was said to be a new American altitude record. He attained a height of 6500 meters" (21,325 feet).

[Hydroaeroplane Altitude Record. *Army & Navy Jour.*, Dec 11, '15. 160 words.]

A second altitude record has been broken at the Navy Aeronautic Station, Pensacola, Fla. Lieutenant Saufley, flying alone, achieved an altitude of 12,135 feet. On a previous flight with a passenger he made an altitude of 8340 feet. These world's records for hydro-aeroplanes were made in Curtiss machines of the school type.

[Note. *Army & Navy Jour.*, Apr 1, '16. 100 words.]

Lieut. R. C. Saufley, U. S. Navy, ascended to a height of 16,700 feet in a Curtiss hydro-aeroplane on Mar 29. The flight was made in three hours, and is probably a world's record for altitude in hydroaeroplane.

[The News of the Week. *Aerial Age Weekly*, Apr 17, '16. 350 words.]

A new American altitude record was established for a pilot and passenger when aviator MacGordon, with a 160 h.p. tractor at Newport News, ascended to a height of 14,800 feet. The previous record of 11,690 ft. was held by Lt. Carberry, U.S.A. MacGordon established a cross country record a week before on Apr 1, when he left Newport News at 10:35 a.m., and after flying to Washington, D. C., arrived back at 3:20 p.m.

[Aeronautical Notes. *Scientific American*, June 10, '16. 100 words.]

Apr 26, at Brooklands, England, H. G. Hawker flew to a height of 24,408 feet in an aeroplane. This is recognized by the Royal Aero Club and constitutes a world's record. Heinrich Hoelerich, a German aviator, flew to a height of 25,756 feet in 1914. This flight has not been recognized by the Royal Aero Club.

**—Altitude Records and Indicators**

[Automatic Minimum Altitude Indicator. By Francisco de P. Rojas. *Mem. de Ingenieros*, Mar, '16. 2000 words. Diagrams.]

In aerial navigation on a dark night or a cloudy day, it is essential that the navigator of a balloon or a dirigible know when he is at a minimum safe altitude above the ground. For dirigibles, this distance is about 400 meters. The barometer indicates the height above sea level or above the starting-point, and hence cannot be used.

The apparatus here described is an electric indicator. It consists of a box containing a copper lever, one end of which is pivoted to a side of the box; two springs, one fastened to the top of the box, the other to the bottom, keep the lever pivoted between two contact points. A strong, short cord is fastened near the free end of the lever and passes thru a hole in the bottom of the box. In turn, the cord is fastened to a weaker cord about 400 meters long, to the lower end of which is attached a weight of 400 grams.

The warning device consists of a dry cell and a small lamp and bell, which are placed in parallel. The circuit is completed thru the upper spring, lever and contact points.

When the weight or cord is caught in some obstacle, the lever is pulled down and makes contact with the lower point, thus closing the circuit. The weaker cord will readily break, so that the dirigible will suffer no shock. When the weight rests on the ground the lever is pulled up and makes contact with the upper point.

The springs also prevent a false alarm being given, due to the inertia of the weight, in case of a sudden descent or ascent.

**—Armored Aeroplanes**

[Armor-Plating an Aeroplane. By Ladislav D'Orsy. *Scientific American*, Sept 30, '16. 1500 words.]

Protection for an aeroplane depends upon its type. The speed machines cannot carry much weight and hence must be armored lightly or not at all. The Nieuport (1914) armored scout achieved brilliant results. It was a monoplane of 24 square meters area, 100 h.p. Gnome engine, speed 145 km. per hour, able to climb 133 meters per minute. Armor 3.5 mm. thick covered the cockpit and engine hood. Weight of machine complete with two persons, machine gun and 3½ hour's fuel supply, 1000 kg.

The bombing aeroplane has greatest need of armor. British regulations require bombing from an altitude of 300 feet, French regulations of 600 meters. The armor protection can be efficient only against rifle and machine gun bullets. Nickel-steel plates three to four mm. in thickness suffice and can be used on limited areas to protect engine and crew. The struts and control cables remain exposed and must be in duplicate or otherwise designed to permit passage of bullet with little harm. The type of aeroplane, pusher or tractor, has some effect upon the protection required. A new type of fuselage made of several thin layers of wood glued together is little weakened even when several bullets hit close together.

**—"Battle Planes"**

[The Aeroplane Dreadnought. *Scientific American*, Dec 11, '15. 800 words.]



It is an ill wind that blows nobody good, for out of the tragedy of the European War, one redeeming feature appears—the rapid development of aviation. Speed, progress in the direction of securing capacity for high and fast climbing, great loads in fuel, bombs and armament, have resulted in the development of the aeroplane dreadnought.

Since money has been no object, this development has been accomplished by the construction of expensive motors. In times of peace, economic reasons would have retarded the development of these motors. The war has demanded the services of aeroplanes carrying great loads; hence, the "battle planes," for which the Curtiss experiments for a Transatlantic aeroplane, and the Sikorsky "omnibus," paved the way. One question, however, the influence of size on wing pressure in the theory of the construction of these giant machines, remains unsolved, due chiefly to neglect. Indications point that a new design for these mammoth dirigibles is imperative.

[Progress of the Seagoing Flying Boat. By Baron Ladislas D'Orcy. *Scientific American*, Dec 25, '15. 1800 words. Illustrated.]

(Note.—Part of this article describes the "America" type of aeroplane. Orders for 32 of these machines have been placed by Great Britain. The America type has been used effectively in scouting for submarines.)

The new "battleship aeroplane" is a triple screw triplane, weighing 21,450 lbs. when fully equipped. The hull of the boat is 68 ft. long by 20 ft. beam. The fuel tanks carry 700 gallons of gasoline and 80 gallons of oil, giving a cruising radius at 75 m. p. h. of 675 miles.

The three planes are each 133 ft. by 10 ft., with 10 feet space between planes. The motive power consists of six 160 h. p. V-type engines, coupled in pairs, driving a central pusher screw and two side tractor screws, the screws being 15 ft. in diameter. An auxiliary 40 h. p. starting engine is provided. The multiplication of engines gives a great degree of safety in the propulsion plant. A single screw would give a gliding angle of 1 to 15.

There is a considerable margin of weight for armament, and it would be possible to carry a 6-pdr., capable of practically all around fire.

[Gigantic German Battleplanes in Building. Aeronautic Note. *Scientific American*, Dec 25, '15. 100 words.]

Baron Cederstrom, director of the Swedish government aeroplane factory at Soedertelge, is reported to have seen battleplanes building in Germany which he describes as "three times the size of the ordinary Albatross type, with tremendous lifting power, great stability, high speed, and carrying an unprecedented weight of armor, armament, fuel, and provisions, together with a large crew." These battleplanes are steered from a bridge.

[American All-Steel Battle Plane with Turrets at Plane Tips. *Scientific American*, Jan 8, '16. 500 words. One illustration.]

A new all-steel battle plane, designed by G. C. Loring, was tested Dec 12 by Lt. B. Q. Jones, U. S. Army. The machine has a wing spread of 65 feet, and vanadium steel is used in the frame instead of wood. Parts are made interchangeable for economy and facility of repair. A 140-h.p. motor gives a speed of 90 to 95 m.p.h., and fuel for 800 miles is carried. Two gun turrets, giving 200° horizontal and 90° vertical field of fire, are located at the tips of the planes.

[New Air Machines. *Army and Navy Gazette*, Oct 16, '15. 300 words.]

The French have for some time past been making extraordinary efforts to create new types of aeroplanes, including great super-planes, mighty triplanes, called "*avions de bombardement*," having a wing spread of 70 feet, carrying twelve men and four 1½-inch guns, with a speed of 80 m.p.h.

Whole squadrons of them are leaving for the front, and their rôle will be the bombardment of enemy positions as an accompaniment to the land batteries. The new small biplane will be armed with a machine gun and will perform the duties of an air scout. The great feature of these small biplanes is the ease and speed with which they leave the ground and rise to great heights. They carry only one man who is observer, pilot and gunner. The machine can be maneuvered without using the hands. New pilots are being turned out now for these machines in one-half the time thought necessary before the war.

[The Battle Plane and Dirigible. By L. Goldmerstein, Associate Ed., A.S.M.E. *Journal Aeronautical Society of America*, July, '16. 1600 words.]

The selection of a proper type of aircraft for the defense of this country is a matter of high importance, not only because of the influence it may have on a possible struggle, but also because of the expense of a sufficiently large aerial fleet. Such a fleet will probably cost between sixty and eighty million dollars. In the present war the Zeppelin has been working under very favorable conditions, because the French and English have no highly developed fighting dirigibles and because the anti-aircraft guns are not efficient enough to bring down a Zeppelin.

To protect a city of the size of London against aerial attacks, aeroplanes must be used which have the same radius of action and greater speed than the attacking dirigibles. The Zeppelin is more than able to protect itself against the present small aeroplane. However, the future battle-plane, having a span of 200 feet, with engines of 3000 hp., a speed of 90 miles per hour, and capable of sustained flight for ten or twelve hours, will be the master of the Zeppelin.

Great Britain should have 500 such machines, with fifty in the air over the North Sea all the time. Then the Zeppelin could be met both coming and going, and the chances of its escaping would be very small indeed. As a fighting unit, the dirigible has

**AERONAUTICS—Continued**

reached its greatest development and will be obsolete in two or three years. The battle-plane is the fighting machine of to-morrow, and should form the basis on which the aerial fleet of the United States is built.

[Specifications for Army Training Machines. *Aerial Age Weekly*, Aug 21, '16. 5000 words.]

A complete list is given of the specifications of the Army Training Machine as issued from the Aeronautical Division, Signal Corps.

The main features are: Ability to carry a pilot and passenger and three hours' supply of oil and fuel; a slow speed of 37 miles per hour, a high speed of not less than 66 miles per hour, climbing power of 10,000 ft. in less than two hours and of 2200 ft. in ten minutes. The machine must be able to make sharp figure 8's, dives, stalls of various kinds, side slips, and suddenly to stop the motor while climbing. It must execute such other maneuvers as are deemed necessary. It must be able to turn around on the ground within a reasonable distance under its own power. It must have a factor of safety of 7.5 for an air speed of 100 miles per hour.

The following instruments must be provided; aneroid barometer, clock, speed indicator (motor), gasoline supply gauge, oil sight gauge, radiator water thermometer, pressure indicator for gas system, safety belts and pyrene fire extinguisher.

[Aviation Fleet for U. S. Coast Guard Service. *Aerial Age*, Aug 28, '16. 450 words.]

The Naval Appropriation Act authorizes the establishment of ten aerial stations, with two aeroplanes each, at such stations along the Atlantic, Pacific and Gulf coasts as the Secretary of the Treasury shall select. An aviation School is also created with one instructor and one assistant.

[Aviation Notes. *Army & Navy Jour.*, Oct 14, '16. 100 words.]

During the first seven months of 1916, U. S. Army aviators have made 4000 flights, aggregating 1800 hours for approximately 110,000 miles, without a fatal accident and with little damage to matériel.

See also

Balloons (Article: "Military Ballooning")

—Bombs and Bomb Dropping

See

BOMBS—AERIAL

—Coast Defense, Use of in

See

COAST DEFENSE—USE OF AEROPLANES IN UNITED STATES—COAST DEFENSE—AEROPLANE SCOUTS

—Control Equipment for Aeroplanes

[Dep. Control now Standard in Army and Navy. *Aviation*, Sept 1, '16. 300 words.]

The Dep. Control has been adopted as the

standard control for both the Army and Navy. Machines, with the old controls in one seat and the Dep. in the other, have been ordered for the various aviation stations for instruction purposes. The Dep. is used exclusively by the English and French Flying Corps. In this control, a foot bar controls the rudder, the movement of the wheel column forward and aft controls the elevator, and the movement of the wheel around its axis controls the lateral balance.

—Design of Aeroplanes

[Constructional Details. *Flight*, Nov 5, '15. 1100 words. Illustrated.]

The illustrations show a form of undercarriage, or chassis, in which skids or runners are entirely dispensed with. This type, known as the "Vee" type, is rapidly gaining favor both with designers and practical aviators. It combines great strength with minimum head resistance. There are, generally speaking, two forms of the "Vee" type chassis: one in which the struts form a "Vee," as seen from the side, and the other in which an additional pair of struts form a "Vee," as seen from the front. One of the best-known examples of the latter form is the undercarriage of the Morane-Saulnier monoplane.

Undercarriages of this type are made from steel tubing or from wood. The all-steel chassis is very strong, but on account of the amount of welding involved it is comparatively expensive to make. Furthermore, in case of damage, any separate member of the steel "Vee" chassis is difficult to repair. The wooden "Vee" chassis is not as strong as one built throughout of steel, but it is less expensive to make and is easier to repair.

[The Military Aeroplane Problem. *Army & Navy Jour.*, Sept. 23, '16. 800 words.]

The Signal Corps, U. S. Army, has issued an important memorandum on "Military Aeroplanes." The so-called two-place reconnaissance tractor biplane with one motor is pronounced a false development. The purpose of the memorandum is to initiate discussion, and in this it is likely to succeed. Criticism of existing types is based upon wide knowledge of European War experience in aeronautics. The knowledge of this experience is to be used to help motor builders in perfecting designs.

Several types of aeroplane are discussed. The pursuit type can safely follow the Fokker, Nieuport, and Vickers models. They should number 21 per cent. of the total. For the strategical two-man reconnaissance machine, a 260 h.p. one or two unit machine is suggested. At present, no satisfactory motor of over 200 h.p. has been developed. This type of machine should number 28 per cent. of the total. A scouting type of low weight and small span would be required, in number 20 per cent. of the total. A type with twin motors of about 180 h.p. each is required for bomb-dropping. A cheap training machine is also needed.

[The Giant Aero and the Square Cube Law. By Mr. Sellers, Naval Consulting Board, *Aero World*, Aug 16, '16. 1350 words.]

As we are constantly hearing of Giant Aeroplanes it is interesting to inquire into the limitations as to size. As the area of any body is squared the weight is cubed. This rule applies to aeroplanes but not strictly for some modifications and saving of weight can be made. The weight carried can be increased by getting more speed, but this is limited.

The weight of the power plant varies almost directly with the horse power. An aeroplane with about a 100 h.p. motor will carry one passenger and enough fuel to make a longer flight than any larger size.

Aeroplanes will be built larger as we need them, but the square cube law must be reckoned with.

[The Steel Construction of Aeroplanes. By G. C. Loening, Vice-President Sturtevant Aeroplane Co. *Aviation*, Aug 15, '16. 2660 words. Illustrated.]

The use of steel in aeroplane construction has many advantages in reliability, lightness and strength. The metal fittings used to fasten the wooden members of an aeroplane have become more and more complicated. A steel tubing structure is stronger than a wooden structure for the same weight. The fuselage of the Sturtevant tractor is made of longerons of steel angles, struts of steel channels and a few special rolled sections. The test of strength made after construction compared most remarkably with the computed strength. In addition to the fuselage, the engine beds are made of steel. Work is now under way to make the rudder, wing flaps and the wing structure all of steel. The steel wing has been given severe tests and found to stand up under them.

The fuselage of a Sturtevant battle plane weights 165 lbs. A fuselage of corresponding size and strength and wooden members would weigh over 200 lbs. The work of construction is very simple, as the channels are received from the mills and then cut off the proper size. The lengths are then bent to suitable shape and are ready to be attached to the neighboring members without any fitting being necessary.

The disadvantage of steel crystallization is done away with by using shock absorbing pins and having vanadium steel members which are proof against crystallization.

The wing construction made of channels by pressing out lightening holes, weigh less than 1/2 lb. per sq. ft. A section 8 ft. wide tested for breaking with sand bags was broken with a load of 2550 lbs. As this section was designed to carry a load of 300 lbs. the factor of safety is over eight. The ease of putting together, the excellent fit of all members and the lack of deterioration due to the weather are all advantages of steel construction.

See also

AERONAUTICS—THEORY OF

## —Instruction and Training

[First Aero Squadron's Flight. *Army & Navy Jour.*, Dec 4, '15. 1200 words.]

The First Aero Squadron flew from Fort Sill, Okla., to Ft. Sam Houston, Tex., a distance of 450 miles, thus making a transfer of station by flight accompanied by auto supply trucks. The squadron consisted of six Curtiss biplanes, weighing 1350 lbs., 40 feet spread. The machines were purchased last July and cost \$7500 each.

The flight was in five stages, the first from Ft. Sill to Wichita Falls, 40 miles in 38 minutes; second stage, Wichita Falls to Ft. Worth, 100 miles in two hours, altitude 5000 feet, strong head wind; third stage, Ft. Worth to Waco, Tex., 90 miles in 90 minutes at an altitude of 4500 to 6000 feet; fourth stage, Waco to Austin, 80 miles in 90 minutes; fifth stage, Austin to Ft. Sam Houston, data not given.

[Cross-Country Flight, 1st Aero Squadron. *Army & Navy Jour.*, Dec 18, '15. 600 words.]

In the flight from Fort Sill to San Antonio, the need of hangars and landing places at suitable intervals was felt. The motor trucks were subject to severe test over poor roads, and they could not keep up. Two trailmobiles were used. On good roads, they did not affect the speed, but in sand they reduced the speed about 25 per cent. The need of good maps is urgent. The Geological Survey sheets were unsatisfactory, and the Post Office Department maps were lacking in detail.

[100,000 Miles in 14 Months. *Aerial Age Weekly*, Apr 24, '16. 500 words.]

United States military airmen have covered a distance equal to about four times around the world in training flights between Jan 1, '15, and Feb 29, '16. Seven machines have been used in this flying. A remarkable feature of this flying is that not one fatal accident has occurred in that time. There were 3386 flights made with a total of 1683 hours and 38 minutes flying time. During Jan and Feb, 1916, 570 flights were made with a duration of 257 hours and 25 minutes and a distance covered of 21,560 miles. Training is done while flying at a height of 200 or 300 feet, while in France training is done by hopping a machine across the ground.

See also

AERONAUTICS—PERSONNEL—SELECTION OF

## —Instruction and Training—Selection of Recruits

[Foreign News, French. By James E. Clark. *Aerial Age Weekly*, Apr 3, '16. 1860 words.]

To get into the French aviation service, the candidate must have unusual physical and mental qualities. He must not only be able to control a machine in the air, but must be able to control himself. To ascertain whether or not he is able to withstand shocks, ingenious methods have been devised for his examination. The candidate must perform satisfactorily a rhythmic and continuous movement with both hands, the regularity and

**AERONAUTICS—Continued**

power of which are registered on a paper drum. He is seated before a clock, the hand of which makes one revolution every second. As soon as he sees the hand move, he stops it by pressing a button; the record shows the rapidity of synchronism between the brain and hand. Recording instruments are attached to his chest and pulse to register heart and lung movements, and an instrument is given him to hold in his hand. He is then suddenly subjected to some violent sensation, such as the blinding flare of a magnesium light, a loud report, or a splash of ice cold water. Any strong-willed man may be able to control his muscles so as to give no outward sign, but the machines record the slightest tremble or faster heart beat. The standard for the first test is rhythmic effort without fatigue equal to three hundred lbs.; second test is time between starting the hand and pressing the button to stop it,—nineteen one-hundredths of a second; third test, all symptoms of agitation should be at their maximum at the moment of disturbance.

**—Instrumental Equipment for**

[Specifications Covering Requirements of Aeronautic Instruments for the Army. *Aerial Age Weekly*, Aug 14, '16. 1800 words.]

A complete description, list of requirements and use of the instruments named below are given to show manufacturers and other interested just what development is required and the difficulties to be overcome in the design and construction of aeronautic instruments.

The following are included: Barometers, compass, air speed meters, drift meters, tachometers, oil gauge, oil pressure gauge, gasoline gauge, gasoline flow indicator, distant indicator, barograph, angle of attack indicator, radiator temperature indicator, gasoline feed system pressure indicator, sextant and aeroplane director.

See also

**AERONAUTICS—ALTITUDE RECORDS AND INDICATORS****—Launching Devices**

[Aeroplane Launching Device. *Army & Navy Register*, Nov. 13, '15. 250 words.]

A new device of considerable interest is that for launching aeroplanes recently installed on the U.S.S. *North Carolina*, the aeronautic ship. By means of this device an aeroplane was successfully launched from the *North Carolina* while the latter was underway—the first time such a feat has ever been accomplished.

The device is in the form of a car on a track. The aeroplane is secured in place on the car, and, the aviator having taken his place and the motor having been started, the car is propelled along the track at a speed increasing from zero to fifty miles an hour. At the end of the track the car is brought to a sudden stop, but the aeroplane, released when the car stops, proceeds in flight under its own power.

**—Launching Naval Torpedoes from Aircraft**

[A New Form of Fighting Aircraft. By Robert G. Skerrett. *Scientific American*, Dec 11, '15. 1230 words.]

Rear-Admiral Bradley A. Fiske, U. S. N., has recently amplified the method of launching submarine torpedoes from seaplanes. This new torpedo is susceptible of wireless control. He proposes a scheme whereby the torpedo is provided with bow and stern uprights, which are used as navigational guides and as supports for the wireless apparatus. Each upright carries a small light, so screened that it can be seen only from the rear and above. The lights render the torpedo visible to the controller at night and in dim or hazy weather. This visibility overcomes the objections to all dirigible torpedoes heretofore proposed. They could not be kept track of from the operative base when the air was hazy or the light dim; their employment after nightfall was practically out of the question. Under Admiral Fiske's scheme, the torpedo is attached to a giant aeroplane that has a ship for its operative base. After the torpedo is launched its course is steered either from a ship in the distance or from another accompanying aircraft large enough to carry the necessary wireless apparatus. In case, however, that the wireless mechanism were aboard a ship, it would be necessary to inform the vessel how to steer the torpedo. For this purpose a wireless outfit on the aeroplane carrying the torpedo would answer.

**—Legal Regulation of**

[First Conference of the Pan-American Aeronautical Society. *Revista Militar* (Argentina), May, '16. 1800 words.]

The conference was held at Santiago, Chile, on March 17, 1916. With reference to legislation on the subject of aerial locomotion, the society recommends that the following principles be considered by the Pan-American States:

1. Air space to be declared as state property.
2. Navigation of the air space above the American continent and adjacent seas to be free to all Americans and to aliens domiciled in America.
3. States to have sovereign rights over the spaces above their respective territories.
4. All aircraft to have a nationality; public vessels, that of the state to which they belong, private vessels that of the owner.
5. All aircraft to carry a distinctive national emblem.
6. States to agree upon international regulations governing air traffic.
7. Aerial warfare to be so regulated as to minimize the danger to non-combatants and neutrals.
8. Aerial navies to be used in war under restrictions indicated in 7.
9. The dropping of projectiles to be permitted when the same has a direct bearing on military operations.
10. Private property in the air to be declared inviolable.
11. Belligerents not to interfere with neutral commerce.
12. Neutral states to be declared inviolable.
13. Red Cross air vessels to be used to alleviate suffering.

14. An international Congress to formulate laws for the regulation of air traffic to be convoked.

(The Federación Aeronáutica Pan-Americana was formed at this conference to encourage progress in aeronautics. The statutes of the federation are given. The next meeting will be held at Rio Janeiro in 1917.)

—Light Houses and Beacons

[Aviation Beacons. By Robert G. Skerrett. *Scientific American*, May 6, '16. 400 words. Illus.]

The dangers of landing at night have been partly obviated by a new type of lantern evolved by the Germans. The light itself, backed by a suitable reflector casting the rays upward, is placed in a pit lined with firebrick. Over the grating which covers the pit and which permits the passage of light, is set a wire frame covered with stout gauze capable of diffusing light. The shade is held up by a spiral spring, which collapses when a blow or weight is sustained by the screen. These beacons are placed upon the aviation field at regular intervals.

—Manufacture of Aeroplanes

[The "Arrival" of the Aeroplane. By Algernon E. Berriman, M.I.A.E., A.F.Ae.S., Chief Engineer of the Daimler Company, Coventry, England. *Flight*, Nov 5, 12, 19, 26, '15 9000 words. Diagrams.]

(This is a partly technical article which does not readily lend itself to condensation. It is a brief but interesting discussion of some of the engineering problems involved in the construction of the present-day aeroplane.)

[(Scientific Research in Aeroplane Construction at the Factory of the Curtiss Aeroplane and Motor Corporation.) *Aerial Age Weekly*, July 24, '16. 3560 words. 11 illustrations.]

The Engineering Department of the Curtiss Aeroplane Company has a force of 150 men, covers a floor space of 30,000 square feet, and is divided into departments as follows: (1) Motor designing and testing; (2) Aeroplane designing; (3) Aeroplane development; (4) Research and test. The research and test department is divided into ten departments and does the work which is outlined hereafter.

The mathematical department computes the stress and strain on all parts of a machine, and all improvements on machines before they are constructed.

The chemical department tests all materials used, for strength, durability, composition and resistance to weather.

The heat treatment laboratory secures the requisite hardness for all parts after they have been completed. This amount of hardness is determined by test. Electric furnace, quenching bath, Brunnell tester, a scleroscope, microscope, pyrometer, photo-micrographic camera, and a Riehle testing machine for tension and compression are the instruments used.

The physical department tests the tensile strength and compression, the elasticity, ductility, hardness, yield point, rust defying ability, and resistance to all weather conditions.

The aerodynamical laboratory determines the aerodynamical properties of all types of aeroplanes from the results obtained by models in a wind tunnel.

The propeller designing and drafting division furnishes specifications for all materials used in the construction of propellers, computes the necessary data for their construction, and passes on them when completed.

The indoor testing laboratory tests the accuracy of manufacture and the factor of safety of each propeller. The test varies from a few minutes to many days, depending on whether the design is a new one or an old one.

The outdoor test is made to determine the action of the weather on the propeller and to test its action on a machine.

The photographic studio makes permanent records by means of photographs of all improvements and developments. The engine testing laboratory's main features are special dynamometers and a wind tunnel which carries a blast of air over the motor and carries away the burnt gases. Each motor is given an eight-hour test, then disassembled, cleaned, reassembled and given a half-hour test with its propeller.

The equipment is supposed to be the best in the world.

[Aeroplane Propellers. By Elmer A. Sperry. *Aerial Age Weekly*, Aug 7, '16. 760 words.]

Recently one whole blade of an aeroplane propeller broke off in the air. This unbalanced condition made the entire engine (160 hp.) jump from its bed and hang suspended by a couple of wires. This propeller was ten feet in diameter, and ran at 1400 r. p. m., had a tip velocity of 700 feet per second and consequently developed a centrifugal force on each arm of about 50,000 lbs. Two other forces developed are the axle thrust of 500 lbs. at a radius of 3½ feet and the torsional stress caused by the engine driving the propeller. Another force not understood is the gyroscopic lunge, amounting to about 2750 lbs. at 1½ feet. This force rises to full value from zero every hundredth of a second, and consequently reverses itself and acts in the other direction in another hundredth of a second. This force always appears when the aeroplane moves out of its path suddenly. This force probably caused the propeller to break, for the pilot was in the act of turning when the break occurred.

—Matériel

Germany

[Aeronautics. - German Aviatik of New Type. *Scientific American*, Apr 29, '16. 150 words.]

A new type of Aviatik biplane, recently brought down behind the French lines, has 41-foot span with chord of 6.4 feet. Oval steel tubing is used in frame. Engine, 170 h.p.

**AERONAUTICS—Continued**

Mercédès. Weight, 1600 lbs. Useful load, 1300 lbs. The machine is exceptionally fast and has a climbing speed of approximately 300 feet per minute.

**Great Britain**

[Aeronautics. The Causes of British Casualties. *Scientific American*, Apr 29, '16. 200 words.]

Answering a criticism in the House of Commons that many British aviation casualties had resulted from inferior machines, Mr. Tennant admitted that at present a majority of the German machines were probably faster than the bulk of the British machines. The near future will, however, see the British aviators on superior mounts.

**United States**

[The News of the Week. *Aerial Age Weekly*, May 1, '16. 930 words.]

The "Super America" or model "H 7" was tested at Newport News on Apr 24 and carried eight people. The body of the machine is forty feet long and carries eight people very comfortably in its cabin. It has an eighty-foot wing spread and is equipped with two 160 h.p. motors giving a speed of over 90 miles per hour. A two-passenger military model, "J N 5," having two motors made a speed of 100 miles per hour in its test, and climbed 1000 feet per minute. The tests of the machines recently purchased for the War Department gave the following results: High speed, 92 miles per hour; low speed, 41 miles per hour; climbing rate, 5000 feet in ten minutes.

**—Meets and Competitions**

[Mexican Situation Makes Postponement of Transcontinental Contest Necessary. *Flying*, July, '16. 340 words.]

After a conference at the Aero Club of America, preparations were discontinued for the transcontinental contest in order that aviators and constructors can concentrate their activities on the needs of the country at the Mexican border.

The government needs 200 trained pilots, which number must be furnished by the regular army, the forty National Guardsmen who are nearly ready for service, and civilians.

**—Motors**

[Diminutive Gasoline Engine for Cranking Airship Engines. Aeronautic Notes. *Scientific American*, Dec 25, '15. 100 words.]

A starting engine for aeroplane motors has been developed in England. It is of twin cylinder opposed type, and weighs 23¼ lbs. in all, including magneto and carbureter. The engine is of 4 h.p., speed 4000 r. p. m.

[Twelve Cylinder Aeroplane Motors. Aeronautic Note. *Scientific American*, Dec 25, '15. 100 words.]

Twelve cylinder 60° V-type engines are now used for high-speed, high-power work. These engines are 225 h.p. and work at 3000 r. p. m. The demands on the lubricating system are severe. 35 lbs. per sq. in. pressure is required

to force oil into the bearings. On account of the great heat of the engine, 30 feet of 22-gauge ¾ in. copper pipe is used to cool the lubricating oil.

[Automobile Manufacturers Making Motors in England. *Aerial Age Weekly*, Apr 24, '16. 800 words.]

Most of the aeroplane motors constructed in Great Britain are made by eight automobile firms. In the future, comparatively few motors of less than two hundred h.p. will be made. Although all kinds of motors are in use now, the tendency is toward the V motor, water cooled, of eight to twelve cylinders. For hydro-aeroplane work, twelve-cylinder motors of 300 h.p. are being produced. The most important of these is a twelve-cylinder one having a 100 mm. (3.94 in.) bore and a 160 mm. (6.3) stroke. This change from 75 to 80 h.p. motors running at 1200 r.p.m. to motors 150 to 300 h.p. running at 2000 r.p.m. having a geared down propeller, is one of the most important developments of aeroplane motors. The eight-cylinder Hispano-Suiza motor has pistons made of an aluminum alloy. Its cylinders, cast in groups of four with a separate carburetor for each group, have a bore of four and three-quarter inches, and five and one-eighth inch stroke. When equipped with two magnetos, it weighs 363 lbs., furnishes 200 h.p., burns 11 gallons of gasoline an hour, and uses one gallon of oil an hour. The French acceptance tests require motors to run 25 hours at full power and 25 hours at three-quarters power. The British put all motors through a 100-hour test, and with the big units make them run with their propellers out of balance for a short time at the end of the test.

[Some Features of the Green 300 h.p. Motor. *Aerial Age Weekly*, Apr 24, '16. 1200 words.]

The big Green 300 h. p., 12-cylinder motor is of a Y type more than a V type, but it will fit any machine demanding such power. The crank shaft, made very thick, is hollowed out so as to make it light but strong. The connecting rods have H sections and are provided with a bucket extension on the ends which throws oil on the cylinder walls. The piston heads have two small grooves between the rings which get as much oil as is needed to the right spot. The gudgeon pin is secured to the small end of the connecting rod solidly instead of being pinned stationary in one of the usual ways. To keep the carburetion regular, small wind cowls are fixed in the crank chamber breathing tubes and connected upward by cooled air tubes with the mixing chamber of each carburetor.

[The Development of Engines Suitable for Aeronautic Service. By Chas. E. Lucke. *Aerial Age Weekly*, May 1, '16. 3800 words.]

The aeronautical engine, having certain characteristics never before required or produced, makes air flight possible. The early experimenters, Wrights and Langley, found in 1901 the lightest motor weighing about 15

lbs. per h.p., and began to develop a lighter one. The Wrights made a gasoline motor weighing about seven lbs. per h.p., and Langley a steam engine weighing about two and a half lbs. per h.p. Since that time the greatest progress has been made in Europe. At the present time most of the experts agree on the following qualities as being necessary in an aeroplane motor: reliability, high power-weight ratio, economy in fuel and oil, low air resistance, freedom from vibration, and accessibility. The British government requires in addition: h.p. 90 to 200, must have more than four cylinders, gross weight per h.p. not to exceed 11 lbs., shape of engine suitable for aeroplane. The U. S. Navy Department had the special requirements as follows: to be capable of being throttled down to 20% of the revolutions per minute for full power; weight of engine complete not to exceed five lbs. per brake h.p.; must be able to be started from seat of machine; must have a positive and accurate lubricating system; some safety device on all screws, bolts and nuts; and must be run for half hour under conditions approximating a heavy rain storm. The desirable qualities of aeroplanes agreed on are: must climb very quickly, have a good gliding angle, have a combination of fast and slow speeds, be safe to handle in all winds, and be able to remain in the air for long periods.

[Predominance of Water-Cooled Engines. *Scientific American*, June 24, '16. 100 words.]

Except in England and Austria, the leaning before the war was toward the use of air-cooled, rotary engines. Now the fixed-cylinder, water-cooled engine is predominant. French, English and Italian designers are copying the German Mercedes engines.

[Notes on Radiators for Aeroplanes. By J. C. Hunsaker. *Aerial Age Weekly*, May 29, '16. 2600 words.]

It seems to be the general practice to allow about 1.08 sq. ft. of cooling surface per B.H.P. for honeycomb type of radiators, and .85 sq. ft. for the helical tube type. These figures apply to radiators fitted on military tractors, where one would expect considerable help from the slip-stream of the propeller. For a 100-h.p. motor, the pump must handle about 6 pounds of water per second, or 45 gallons per minute. This is a velocity of 4.5 ft. per second, thru a 2-inch connection. If the total mass of the water is but 25 pounds, the water in the entire system makes a complete change is about 4 seconds.

The feet of tube per B.H.P. may be about halved if the tube diameter and cooling surface per foot are doubled.

The doubling of tube diameter may halve the total length of tubing needed, giving the same tube weight as before, but the water filling the tubes will weigh twice as much as before. The lighter radiator will, therefore, be made of short lengths of fine tubing.

[Germans Copy Gnome Aeroplane Motor. *The Automobile*, June 8, '16. 730 words.]

With the exception of the Fokker monoplane, which uses the Oberussel nine-cylinder air-cooled rotary motor, all of Germany's aeroplanes are equipped with vertical water-cooled motors. The great majority are Mercedes engines, with inclined overhead valves operated by a single camshaft. The latest Mercedes production is a six-cylinder motor of 5.5-inch bore and 6.29-inch stroke, developing 178 h.p. at 1450 r.p.m. It has separate steel cylinders with sheet-steel jackets common to each pair.

As a general rule, the European motors run at about 2400 r.p.m., and have the propeller geared down to 2 to 1. All German motors are partially silenced. The radiators are mounted in the center of the upper plane.

The war thus far has seen the decline of the rotary air-cooled motor and the rise of the six-cylinder vertical and various eight and twelve-cylinder "V" motors.

[Aviation Engines. By J. G. Vincent, Vice-President of Engineering, Packard Motor Car Co. *The Automobile*, June 8, '16. 3600 words. Two illustrations.]

The only nation that adopted any concerted plan for the production of aeroplane engines at the beginning of the war was Germany, which permitted the automobile engineers to make the aircraft motors just as they would racing-car engines.

The Mercedes is nothing more than a good vertical six-cylinder, in which lightness is obtained by making use of the strongest materials. Before the war the rotary engines were developed to a point where their volumetric efficiency was high, and they produced a remarkable power per pound of weight. However, in figuring the weight of an aircraft engine, its consumption of oil and gasoline must be taken into consideration. The enormous quantity of fuel and oil required for most of the French motors makes them undesirable for long trips. The French appealed to the automobile industry, and so water-cooled six, eight, and twelve-cylinder motors began to appear.

When it is necessary to carry much weight, the fixed cylinder type of engine is used. The intensity of heat from exploded gasoline limits the size of pistons that can be used. The six-cylinder motor gave sufficient power at first; then as more power was desired, the eight-cylinder "V" motor was developed, and this was soon followed by the twelve-cylinder "V" motor.

The Packard Co. has set out to develop a couple of twelve-cylinder aviation motors, according to the following specifications:

All propellers are more or less out of balance, and this, with the air stresses, puts some heavy strains on the propeller and its mountings.

By having a geared-down type of propeller, some of the strains on the crankshaft due to the propeller are eliminated, but are put somewhere else. However, an efficiency of 98 or 99 per cent. can be obtained.

**AERONAUTICS—Continued**

The crank case and the case to carry the propeller mounting must be made out of an alloy a little stronger than aluminum. Two overhead camshafts will lighten the reciprocating valve parts, and need not add to the weight of the engine. The carburetor should be in the center with the manifold, and the exhaust pipes on the inside. Although expensive and harder to make, the cylinders should be of steel, all properly machined up and welded together. It will be so hard to turn over a twelve-cylinder motor whose cylinders have dimensions 4 x 6 inches, that a starter will be necessary.

In order to fit in the fuselage, the width must be twenty-six inches or less; hence the cylinders will have an angle of 40 degrees instead of 60 degrees. The slight variation in impulse frequency, due to setting the cylinders at 40 degrees, cannot be neglected at speeds over 500 r.p.m. Weight is secondary to reliability and economy.

[The Development of Engines Suitable for Aeronautic Service. By Chas. E. Lucke. *Aerial Age Weekly*, May 15 and 22, and June 12, '16. 7300 words.]

The art of flying has not yet reached a point where a fixed minimum weight of the engine per h.p. can be called for. While reliability is demanded, absolute reliability is impossible, for that would mean continuous uninterrupted operation. In the same way, shape, vibration, silence, accessibility and uniformity of torque are specified to-day only in a comparative way. The three periods of development are the period of invention, the period of design, and the period of manufacture. The aero engine has not reached a state of commercial perfection, because as yet the service requirements are not fully formulated, and because of the means employed in the development. The military establishment can purchase in the open market only when there is a reasonably strong civilian demand for the same article. The present European war has demonstrated that no matter how imperfect the aeroplane is, it is a military necessity and must be perfected.

The largest single factor for the development of the aero engine will be governmental aid, involving the operation of laboratories to determine by test the results obtained by designers and producers, and perhaps by the distribution of cash prizes for contests. However, contests exert but an indirect effect on engine development. Any test that measures only over-all results, such as fuel and oil consumption, weight, speed, torque, and similar quantities, is faulty as a direct factor in engine development. The determination of the causes of faults and the discovery of the remedies is the kind of development work that must be done, and is now only carried on to a small degree. Since 1901 there have been produced over a hundred different designs of engines that have survived the stage of first trial. The number of engines that reach or exceed one hundred h.p. is steadily increasing.

Speed of all engines is in excess of 1000 r.p.m. It is just here that so many failures are found, the engines literally shaking themselves apart and pounding or grinding themselves to pieces. Engine weights attained per h.p. developed have not been materially lowered for some time. The Gnome motor weighs about 3.1 lbs. per h.p., while the best German vertical water-cooled motor weighs about 4.2 lbs. per h.p. The Gnome consumes a total of 1.058 lbs. of oil and gasoline per h.p.-hour, while the Benz referred to above consumes only 0.514 lbs. Thus, including the weight of engine, gas, oil and, in the case of the Benz, the radiator, the weights per h.p. for a ten and twenty-hour run would be:

	Ten Hours.	Twenty Hours.
Benz, pounds .....	9.34	14.48
Gnome, pounds .....	13.48	24.06

Tanks for gasoline and oil will weigh more for large than small supplies, but not in proportion to their volumes. Other things being equal, that shape of tank will weigh less that has least weight per cubic foot of volume.

[The Wright-Martin Aircraft Corporation and the Hispano Suiza Motors. *Aerial Age Weekly*, Aug 16, '16. 1020 words.]

The Wright and Martin Aircraft Corporation has the rights for the manufacture of the Hispano Suiza Motor. This motor develops 150 h.p. and weighs only 2.42 lbs. per h.p.; it was so popular with the French Government that they ordered 1800 almost within a month.

Within a very short time after its introduction the French regained control of the air from the German Fokkers.

[The Mercédès Aero Engine. *Aerial Age Weekly*, Sept 11 and 18, '16. 3240 words. Illustrated.]

The success of the German aeroplanes is due to the reliability of their 160 h.p. Mercédès engines. This engine was not designed for maximum power efficiency, as the propeller is run from the crank shaft at a comparatively low speed. The motor in question here was dated 1915, so that it probably does not have the latest features. The workmanship on the motor is the very finest, and reliability has been sought to the exclusion of all else. No attempt has been made to cut down weight, and the result is that this motor compares most favorably with an automobile engine when the questions of overhauling, need of attention, long life and reliability are concerned. Long bolts pass through the bridges in the lower half of the crank case upward through the upper half, and emerging between the cylinders, are used to hold down the cylinder base flanges. Thus these bolts take the weight of the lower half of the crank case. The cylinders made of cast steel are separately mounted and very light for their size. The walls are about 3/20 of an inch thick. The water jackets are separate and welded on to the cylinders. A cylinder complete with valve springs, two spark plugs and two water connections weighs 22¼ lbs. No attempt has



been made to stream-line the under face of the valves or to strengthen them at the juncture of the stem and valve head. The bore and stroke are 140 mm. and 160 mm. and the valve head 72 mm. in diameter. The pistons are in two parts, the crown and gudgeon pin bosses being made of steel and the piston walls of cast iron.

The piston head is concave and has three piston rings, each 4.95 mm. wide. The piston weighs 5½ lbs. complete with rings. The connecting rods weigh 6 lbs. and have an H cross section and are machined all over. The hollow crank shaft weighs 80 lbs. and is five feet long. Two vertical shafts driven from the crank shaft drive the two magnetos, the centrifugal water pump and the overhead cam shaft. The cam shaft has an eccentric situated just in front of the bevel pinion which drives an oil pump to supply pressure to the fuel system. An ingenious device attached to the cam shaft enables the motor to be started on half compression. This makes starting easier and also permits the engine to run very smoothly while running idle. The oil is driven through the system under pressure from an oil pump. The carburetor is of the simplest type; it has two jets, each one supplying gas to three cylinders. The magnetos are of the Bosch type, each one firing six spark plugs. The engine complete weighs 595 lbs. and has a weight ratio of about 3¼ lbs. per h.p.

#### —Naval Use of

[Naval Aeronautics. By Godfrey Cabot. *Aerial Age Weekly*, June 5, '16. 1200 words.]

The recent gun practice at Guantanamo Bay, in which aviators directed the fire, established the necessity of launching aeroplanes at sea. At a range of 18,000 yards, the sea surface is not visible from the deck of a ship. Even from the fighting top it is impossible to tell how much short the shells are falling.

Under ordinary conditions, aviators unquestionably increase the efficiency of gun fire, and when there is a fog the advantage of an aviator increases incomparably. There should be constant practice to get efficiency and keep it. There should be three types of machines—(1) for observation, two for each ship; (2) for fighting in the air, two for each ship; (3) for torpedo carrying, one for each ship.

In fog it is perfectly feasible for an aviator to drop a torpedo close enough to a ship to sink it.

#### —Night Operations

[Night-Flying in France. *Sphere*, Mar 25, '16. 400 words. Illustrations.]

Before the war the Germans made night-flying a regular exercise for their military officers, and were far ahead of the other nations in this dangerous work as in many other military matters. They had reliable engines, and were relieved of worry over engine failure.

Searchlights with vertical beams are used to guide the night fliers home. This beam shows up to an aviator in cloudy weather as a gleaming disc. In the vicinity of the beam the aviator circles slowly down and a num-

ber of cans of petrol are fired to illuminate the landing. The greatest difficulty in night flying is in making the landing, as it is almost impossible to judge the distance to the ground unless the latter be fully illuminated. Searchlights have to be so manipulated as not to strike the eyes of the pilot and thus temporarily blind him.

The Germans use a system of red lights at cardinal points with a white light in the center for guidance of night fliers.

#### —Personnel—Selection of

[Selecting Aviators. Psycho-Motive Examination of Candidates for the French Service. By Jacques Boyer. *Scientific American*, July 1, '16. 1500 words. Illustrated.]

The methods of test were devised by Drs. Camus and Nepper, and are intended to measure the time of reaction to an ordinary stimulus by means of a chronoscope. Such measurements are supplemented by instruments which record the behavior of the respiratory and circulatory systems.

The apparatus is arranged to register accurately the time interval between a stimulus to the hearing or sight and a muscular reaction. Application of the tests to a large number of candidates has established auditory and tactile reaction intervals of 0.14 to 0.15 second, and visual interval of 0.19 second, as a first-class performance. Candidates with auditory intervals greater than 0.17 second, tactile intervals greater than 0.20 second, or visual intervals greater than 0.22 second, are rejected as unfitted for aviation service. A sort of recording stethoscope shows the heart and respiratory action. These should not be greatly affected by unexpected occurrences.

The tests mentioned constitute a good gauge of whether a candidate possesses the qualifications necessary to meet the many emergencies of aeronautical service. The muscular capacity of the arms is tested by suitable machines in which the number of contractions of a muscle to exhaustion are recorded. By this means the ability to stand the muscular strain on the hands and arms of a pilot is determined.

All such tests are compared with the results obtained by the examination of a number of successful French aviators.

[Course of Instruction and Required Qualifications of Personnel for the Air Service of the Navy. By Victor Blue, Chief of Bureau. *Flying*, Aug, '16. 3000 words.]

The classes, consisting of seventy-eight line officers, are detailed every three months, and the course lasts for two years for officers, and eighteen months for enlisted men. Both officers and enlisted men must have two years service before being admitted. The officers on duty with the air service are classed as students, aviators, aeroplane pilots, dirigible pilots, and military aviators. The course at the school is both theoretical and practical, and includes shop work, lectures, flying lessons, elementary flying, advanced flying, and aircraft station administration. Students receive monthly marks. No student can take

**AERONAUTICS—Continued**

the tests as a naval aviator until he has had at least fifty hours flying. Only commissioned officers who have qualified as aviators are allowed to take the course of instruction as Navy Air Pilot. This course consists of taking sights in aeroplanes, working out sights while flying, compensating aeroplane compasses, installing aeroplane compasses, open sea scouting flights, solution of scouting problems, and controlling the fire of the guns of an aeroplane. All students receive a month's course in both the machinery erecting shop and aeroplane erecting shop.

**—Propeller Hubs**

[Standardization of Propeller Hubs. By Charles L. Lawrence. *Journal of the Aeronautical Society of America*, Mar-Apr, '16. 1000 words. Two diagrams.]

Unless some standardization of propeller hubs occurs, the Army and Navy will soon be forced to carry a very large stock of propellers for their various types of machines. In Europe, in order that any propeller may fit any suitable engine, the hubs are separate from the engine, and the propeller and hub form a unit which is mounted on the tapered engine shaft. The foreign type of hub which should be standardized, consists of: (1) A hub with a tapered hole and key-ways and a flange at one end. (2) A loose slotted flange used to clamp the propeller against the hub. (3) A special nut which presses the hub against its taper on the shaft, and which when removed withdraws the hub. This design is heavier than the American method of mounting propellers. A standard design must be large enough to fit the largest shaft of any engine manufactured in the United States, and it should be a compromise in order to fit the greatest number of engines. In order that this enterprise shall have an official backing, the co-operation of the Army and Navy should be obtained.

**—Protection Against Aeronautic Attack**

[Aerial Defence and Offence. Editorial. *Army and Navy Gazette*, Feb 12, '16. 1500 words.]

The anti-aircraft defenses of London have passed from the control of Sir Percy Scott into the hands of the staff of the Home Army. A great development in these defenses has taken place since the last air raid. The Admiralty and the War Office have worked harmoniously in the development of the defenses, but the point has been reached where unity of control is desirable, hence the transfer. A transfer that would entirely separate a man of Sir Percy Scott's ability from all connection with the defenses could hardly fail to create uneasiness.

There is discussion of the question of whether or not there should be a Minister of the Air, as there is a Minister of Munitions. If the fighting services in which aircraft form an essential adjunct consider that this arm could be better organized if under the control of a separate office, then and only

then should a change be made. But everything would depend upon the choice of the man. An aerial inventor or crank in charge would be a calamity. The admirals and the generals are the men to say how far and in what way aircraft should be employed, and not panicky people who demand reprisals.

A golden opportunity to learn more of the details of Zeppelin construction was lost when the Zeppelin "L 19" was sunk in the North Sea. It is to be regretted that the means were not at hand or were not utilized to tow the Zeppelin into port.

See also

**INFANTRY—FIRE—ANTI-AIRCRAFT****—Reconnaissance**

[Is it Possible to Protect Ourselves Against Aerial Observation? Capt. von Stockhausen. *Militär Wochenblatt*. Translated and published in *Rev. de Caballeria* (Madrid). Reprinted in *Rev. del Círculo Militar*, July, '15. 1200 words.]

Military writers are devoting much attention to means of protection against observation by aviators. This is directed to the manner of regulating marches and halts, organizing bivouacs, etc.

This process should not be followed, since it is based on an erroneous idea, assuming the enemy to be incapable or careless.

Conditions will generally be such as to make it impossible to conceal all of a long column, and an observer, having the advantage of mobility, may acquire absolutely certain knowledge of the length of the column in march, etc.

To make a column march through thickets or on the bad side of a road, hoping thus to obtain cover, is a fault due to ignorance. It is much more important to advance the troops rapidly and to conserve their vigor for the moment of combat, than to keep them from the observation of the enemy.

Experience shows that from the air troops in march are discovered with greater ease than troops at rest. From this it has been deduced that columns should halt the moment an aeroplane approaches. But this is impracticable for large units, and it is of these only that we are speaking, since it could but exercise a pernicious influence and paralyze the energy of the soldiers.

It is evident that from a height, lines of skirmishers will be discovered less easily than long columns. Consequently it has been proposed to form line of skirmishers on the approach of an aviator. This is also impracticable.

An alert and experienced observer will always find some means of discovering troops, and it will be work lost to torture the imagination in trying to keep them permanently hidden.

The conclusion drawn is that all aerial apparatus employed by the enemy should be combated with all the means possible. This once destroyed, reconnaissances, etc., may proceed.

[Cloudy and Clear Weather Reconnaissance Work by our Aviators at the Front. *Sphere*, Apr 22, '16. 500 words. Diagrams and illustrations.]

The German anti-aircraft guns are able to hit at 15,000 and even 20,000 feet altitude. The risk of flying as low as 4000 feet is great, and there might even be less risk at lower altitudes. Clouds are used in different ways in fighting and scouting. Many machines are ambushed in the clouds; sometimes low banks of vapor are used as a screen to get near the earth; and again some aviators dip through the clouds for a peep at earth and then seek concealment again in the clouds. In flying above the clouds, it is necessary to fly at some distance above them or the shadow may betray the position.

The Fokker sometimes dives in attack and by a slightly spiral dive secures the necessary dispersion of bullets from its rigidly mounted machine gun.

[From New York to Washington by Air. By Alan R. Hawley, President Aero Club of America. *Flying*, June 16, '16. 2080 words. Four illustrations.]

The two-pounder Davis gun could not be carried as planned, for the machine was to be loaded with 1200 lbs. of fuel, two passengers weighing 370 lbs., and copies of newspaper weighing 200 lbs.

The start was made at 7 a. m., and on the third circle a height of over 5000 ft. was reached.

Perth Amboy, Trenton, Philadelphia and Baltimore were all passed in quick succession.

The Washington Monument was sighted five minutes after leaving Baltimore, and we made a bee-line for it, landing after a couple of spirals, having gone 237 miles in three hours and four minutes.

On the trip every city, every foot of the land and coast lay below us a helpless target.

It was easy to realize why the 500 aeroplanes placed within a radius of 50 miles of London were unable to defend that city from aerial attacks.

[Progress in Aeronautics. By Major H. Bannerman-Phillips. *United Service Magazine*, June, '16. 4000 words.]

"We have seen from the varied experience of the present war that aircraft are urgently required to extend the powers of reconnaissance of scouting surface-vessels at sea, and to spot for their guns and in some cases to carry out observations for the purpose of enabling the fire of warships to be used effectively against targets situated on a coast line, but invisible from a fire-control station, owing to the formation of the ground or to trees and tropical undergrowth. The nature of the requirements of the navy in regard to overhead reconnaissance naturally leads one to consider also areas of utility which are inaccessible to very large heavier-than-air machines, such as the one described last month, since to reach such areas involves the carriage of the machine on board a sur-

face vessel as a normal condition, for utilization on occasion only in the air, whenever circumstances are such that observation from a fixed point on board the latter is of no use. Incidentally, it may be observed, as was also pointed out in connection with the idea of using large seaplanes against the enemy's rigid airships in prevention of raiding, the comparatively small, quick-climbing machine is more likely to be useful as a Zeppelin-chaser and would be effective for dealing with the latter if attached to surface war vessels whose sphere of operations would include enemy ships accompanied by Zeppelins. As gun-fire, otherwise than against hostile aircraft of similar nature, would have little value, and the enemy's airships would be more effectively attacked by bomb-dropping from a superior height, the question of size of guns carried would not be a matter for consideration in regard to the construction of the other machines. Further, if the aeroplanes were to be carried until within easy reach of the locality where they were to be made use of their fuel-carrying capacity need not be large.

There still remains to be considered the possibility of using the heavier-than-air machine for the purpose of launching an underwater torpedo against an enemy's surface vessel, when the latter is beyond the extreme torpedo range, say 3500 yards from our own ships. There are conceivably occasions on which torpedo attack could be carried out by aircraft when it would be otherwise impractical, and the moral as well as the material effect would be serious. But as the weight of the underwater torpedo would not be less than from half a ton to a ton, it is obvious that the lighter or portable type of aeroplane could not carry it. At one time it was supposed that the dropping of very heavy weights, such as large bombs, for instance, from an aeroplane in flight would react disastrously upon the latter, but experience has shown that the disturbance of the flight course thus caused it not so great but that, even with a machine which is not automatically stable, it can be corrected by proper handling of the controls; and in an automatically stable aeroplane the stability afforded by the nature of the design and construction, or by special apparatus, such as the Sperry Automatic Pilot, is proof against the disturbance, provided that the arrangements for carrying the weight to be dropped are such that the center of gravity of the aerial machine does not change in consequence of the release of the former. In fact, if proper arrangements for control are made the course of the aeroplane will only be affected in much the same way as it would be by an adverse gust of wind. The release would cause the aircraft to rise, of course, but the control exercised by the pilot or by the automatic stability arrangements would correct this, and make it follow a course similar to that of a sledge over a switchback or an automobile over undulating ground, the curves of this course gradually flattening out, as the working of

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the controls succeeded in damping out the variations from the horizontal caused by the disturbance, until the flight-course became once more normal."

**—Records**

[Aviation Work of Signal Corps. *Army & Navy Jour.*, Jan 22, '16. 500 words.]

According to the report of the Chief Signal Officer for the fiscal year 1915, the aviation section of the Signal Corps made 3458 flights; total duration, 1269 hours, 50 minutes, and 1730 passengers were carried. One world's record and three American records were established, as follows:

"Oct 8, 1914, Capt. H. Le R. Muller, Signal Corps, in Signal Corps aeroplane No. 30, Curtiss model J tractor, established a new American altitude record for pilot flying alone by reaching an altitude of 17,441 feet. Duration of this flight, 2 hours 27 minutes.

"Jan 5, 1915, 1st Lieut. J. E. Carberry, Signal Corps, pilot, and 2d Lieut. Arthur R. Christie, 22d Inf., passenger, in Signal Corps aeroplane No. 35, Curtiss model N tractor, equipped with Curtiss model OXX motor, established a new American altitude record for pilot and passenger by reaching an altitude of 11,690 feet. Duration of this flight, 1 hour 13 minutes.

"Jan 15, 1915, 1st Lieut. B. Q. Jones, Signal Corps, in Signal Corps aeroplane No. 37, Martin tractor, type TT, equipped with Curtiss O motor, established a new American endurance record by making a flight of 8 hours 53 minutes, the flight lasting from 7.52 a. m. to 4.45 p. m.

"March 12, 1915, 1st Lieut. B. Q. Jones, Signal Corps, in Signal Corps aeroplane No. 28, reconstructed Burgess tractor, equipped with Renault motor, with Corporals Hale and Houser, Signal Corps, as passengers, established a new world's endurance record for pilot and two passengers by making a flight of 7 hours 5 minutes, the flight lasting from 10.02 a. m. to 5.07 p. m."

[News of the Week. *Aerial Age Weekly*, May 8, '16. 1600 words.]

By carrying six passengers 88 miles in 70 minutes, Aviator McCauley, flying a Curtiss H7, broke the world's records for endurance and distance. Aviator De Lloyd Thompson covered a mile in 33 1-5 seconds with a passenger. McCauley carried six passengers to a height of 900 feet.

[Air Notes of the War. *Army & Navy Jour.*, May 13, '16. 200 words.]

According to the naval correspondent of the *London Times*, on April 14 three naval aeroplanes made a flight to the Zeitunlik powder mills near Constantinople and return, a total flight of 300 miles. The previous long flights were from Belfort to Friedrichshafen and return, 240 miles; from Nancy to Ludwigshafen, 230 miles; and from Nancy to Stuttgart, 280 miles.

[The News of the Week. *Aerial Age Weekly*, May 15, 22 and 29, '16. 3500 words.]

A Curtiss Model JN machine, carrying a passenger, climbed 16,500 feet in 1 hour and 30 minutes on Apr 30, '16. The five-passenger hydroaeroplane flew from Newport News to Baltimore, 178 miles, in three hours and three minutes on Apr 6. In a ten-hour test, the average h.p. developed by a Sturtevant motor at 2000 r.p.m. was 141. On the following day the same motor made 145 h.p. at 2025 r.p.m. On May 28 the Curtiss aeroplane which has two 90-h.p. motors, and has a speed of 100 miles an hour while carrying a load of 800 lbs., flew from Newport News to New York in four hours and one minute. Records from the army aviators for the period from Jan 1 to Mar 25 show a total of 1604 flights for a total of 670 hours and 430 passengers carried. Lt. Milling has made a total of 1157 flights, with about 261 hours in the air.

[Aeronautical Notes. French Aviator Over Berlin. *Scientific American*, Aug 12, '16. 200 words.]

Antoine Marchal, a French army aviator, flew 807 miles from Nancy to Chelm, Poland. This establishes a new non-stop record. The machine was a Nieuport monoplane. Proclamations were dropped in Berlin. Marchal descended sixty miles from the Russian lines to change spark plugs, and was captured while thus employed.

[The News of the Week, *Aerial Age*, Sept 4, '16. 3200 words. 3 illustrations.]

Victor Carlstrom in a twin motored Curtiss hydroplane made a new American record for distance covered in one day by flying 641 miles in eight hours and 41 minutes with a passenger on Aug 25, '16. The new twin motored Curtiss hydroplane in its tests at Newport News, made a speed of 80 miles per hour, a slow speed of 45 miles per hour, climbed 2650 feet in ten minutes from the water, carrying a pilot and passenger, 82 gallons of gasoline, nine gallons of oil, and instruments weighing 22 lbs.

See also

**AERONAUTICS—ALTITUDE RECORDS****—Searchlights, Use of in**

See

**SEARCHLIGHTS—AERONAUTICAL USE OF—Tactics**

[How Aeroplanes are Used in War.—(Continuation.) By Correspondent. *Land and Water*, Sept 7, '16. 2300 words, 2 diagrams.]

The "little" aeroplane has the uses of "defender" and of high speed "bomber" for short ranges. The "defender" stays at home, the "bomber" goes abroad. The peculiar activity of the "defender" makes it useful for special services, for example, the extinction of dragon balloons, those ugly yellow sausages of monstrous size which, tethered some 5000 yards back of the line and 2000 feet up, enable an observer to telephone to the gunners the effect of their fire and to direct their aim.

The swiftest of aeroplanes are used for this work. The aeroplane rises to a great

height, then dives down at an exceedingly sharp angle towards the balloon. If the attendants of the balloon are on the alert they haul the balloon down by engine power at lightning speed, but the path of the aeroplane is so steep from the clouds to its prey that often a success is registered.

The attack is usually made *with* the wind in order to get the greatest possible speed.

One of the main dangers of the maneuver lies in the stress imposed on the aeroplane by recovering from the descent and turning the movement into an ascent. The speed in descent may be 150 miles or more per hour, and special caution must be observed to restrain the violence of the "control" if the collapse of the structure of the machine is to be avoided. In making raids on dragon balloons the work is best conducted by numbers of machines simultaneously. Numbers increase the chances of success and the number of shots, and also diminish the danger by distracting the enemy's fire.

Zeppelins are hard to bag for the following reasons: (1) They can climb very fast. (2) There are so many people in them that their look out is more effective than that of an aeroplane. (3) They are very hard to find from an aeroplane. (4) If the Zeppelin finds the aeroplane first, its greater air endurance enables it to take refuge over the sea. An aeroplane light enough to climb quickly over a Zeppelin cannot carry fuel for many hours. There have been two cases where Zeppelins have been bombed by British airmen, the one by day, the other by night. The safe alighting of the aeroplane is the dominant consideration in night work. By night the rigid airship has not the defect of being a large target. It retains all its advantages of long range, rapid rising, multiplicity of engines, its buoyancy independent of engines, its numerous guns in defense, its organized lookouts, its ability to travel slowly, to drift silently down wind, and above all, its quality at night of being as hard to find from an aeroplane as is another aeroplane.

By day the most successful aeroplane for Zeppelin attack is the light fast "defender." Lieut. Warneford's feat was performed with a Morane single seater. By night the most successful aeroplane proved to be one of exceptionally slow alighting qualities and of great strength. Lieut. Brandon used a BE2C in bagging his Zeppelin. The progress of flying is such that the names for the various types are now inappropriate.

For many years all single seated aeroplanes were called "scouts" and their arming was scarcely considered. No one foresaw that single seaters would be used for all purposes and that all aeroplanes must be armed. The absurdity of calling a "bomber" a "scout" is evident. Bombing was little regarded by the Army at the beginning of the war. If reports of the enemy are to be believed, in relation to the expenditure the effects of bombing are insignificant.

[How Aeroplanes are Used in War. By a Correspondent. *Land and Water*, Sept 14, '16, 3000 words, 5 diagrams. (Continuation.)]

(In the previous articles the use of one-seater aeroplanes in the war was in some measure dealt with; in this article two-seaters are treated of.)

There are great merits in having two persons in an aeroplane. They tend to mitigate the extreme loneliness up aloft; the men give each other an important moral support, they are witnesses of each other's prowess; their reports confirm or qualify each other, and for specific purposes, such as artillery direction, while the observer is concentrating his attention on the ground, the pilot can watch for the approach of the enemy's fast defenders or other foes. For artillery direction the observer must have the clearest possible view of the ground, must be kept below the clouds or at the *low* level of some 4000 to 6000 feet, and be freed from other anxieties. All aircraft move extremely fast, as landmen would say, hence the observation of any one spot involves wheeling and circling to keep over that spot with the attendant banking or sloping of the aeroplane. In all these evolutions, there is a tendency for some part of wings and gears to obstruct momentarily the view, and if the flash of the shell to be spotted is not seen by the official observer, the correction of aim cannot be wired home. To secure a clear view, a good deal of the lower wing is often cut away from near the body of the aeroplane. This causes some loss of "performance" of course. At the same time, since attack from above is to be apprehended, a certain part of the top plane which obstructs the view is also cut out. Information as to the precise position in which shells burst is telegraphed back to the gunners according to a secret code or a "clock" code, either by luminous flashes, or by wireless, or even by the prearranged maneuvers of the aeroplane and by reference to specially marked secret maps.

The enemy has little chance of knowing what signalling device is adopted at any moment, so there is more or less immunity from wireless "jamming." Even if the enemy did know the secret at any one time, the damage is already done, and all he can do is to send up one of his fast "defenders" to interrupt the proceedings as far as he can.

The "defender" being a far quicker climber, tries to move up unseen by keeping behind and below the tail of the two-seater "director" aeroplane, firing at it from below. If the observer catches sight of the "defender," he prepares for the attack by getting his gun over the side and facing down. Hampered by the weight of wireless, of two men, of guns, mountings and camera, of stores of photographic plates, and by its cut away planes, the "director" cannot escape by simple fleetness, and so the fight is engaged. Our two-seaters have an excellent bag of enemy craft to their credit, largely because of the coolness of the

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men; and in a substantial measure, because of the superior stability of the British machines.

For some time aeroplanes were operated as single units. To-day the normal case is different, and the two-seaters have a much easier time "in company" than they used to have alone. Fights now occur between twos and threes; patrolling aeroplanes now accompany those engaged in "director" duties. Bombing is done by squadrons and the bombing machines are given an escort of fighting machines. No one can doubt but that in the first year of war we were wise to employ the most versatile "multipurpose" craft; but to-day the uses have begun to settle down. In the German Albatross two-seater the observer, who is also a gunner, is on a back seat which is specially designed to swivel round with him. The gun is mounted on a turret. The observer can bring the gun to bear quickly in any direction except forward. This is not a great disadvantage, as the two-seater, being heavier than a one-seater, will not be the pursuer; hence it will have to fight by firing over its tail.

(Then follows a discussion of the tactical handling of aeroplanes, which is illustrated by the diagrams.)

**—Theory of**

[Reports on Wind Tunnel Experiments in Aerodynamics. The wind tunnel of the Mass. Inst. of Tech. By J. C. Hunsaker, Asst. Naval Constr., U. S. N. *Aerial Age*. Mar 27, '16. 1000 words. Illust.]

The standard National Physical Laboratory Pitot tube was mounted in the tunnel, and connected with the Cattock gauge and the wind speed adjusted to even miles from 2 to 40. Some 100 readings were taken on the Cattock and the alcohol gauge, and the resultant curve was a calibration of the side plate and alcohol gauge in combination.

The Cattock gauge has been adopted as the laboratory standard, but is used only for the calibration of other gauges that may be more easily read. The principle of the gauge is that of an inclined U-tube, fitted with an elevating screw and micrometer by which the gauge is tilted to balance the pressure difference in its two ends. By reading on the micrometer the amount of tilt given, the head in inches of liquid is computed. (A detailed description follows, with reference to illustrative figure.—Ed.)

[Equilibrium of the Aeroplane. Autostability and Flight at Different Velocities. Memoir presented to the Congress of Sciences held in Valladolid by Don R. Casado Moyano, Major of Artillery. *Memorial de Artillería*, Mar, '16. 16,000 words. 31 figures. 3 plates.]

(This article presents in the main an analytical treatment of the subject, followed by a description of an aeroplane designed to meet the requirements set forth.)

[Course in Aerodynamics and Aeroplane Design. By A. Klemin and T. H. Huff, In-

structors in Aeronautics, Massachusetts Institute of Technology. *Aviation*, Aug, '16. 6220 words. 11 illustrations.]

Aviation has always been an experimental art and Langley, when he was conducting his experiments, had before him the papers of Lussac and Navier proving that mechanical flight was impossible. All the data obtained by the Wrights, Chanute and Dr. Zahm were from experiments with gliders and wind tunnels. As all aeroplanes cannot be used for the same purposes, the following types have been developed for special uses. (1). The strategic scout, rather slow but capable of long sustained flights. (2). The high speed scout, very fast and climbs rapidly. (3). Fighting or battle planes, armed and armored. (4). Bombdroppers and weight carriers, no armor or other protection. In order to build machines to comply with specifications for the above classes the machines must be designed in a scientific manner, and not be built and then trust to changes in the machine proper to make them comply with specifications. In full scale experiments so many difficulties are encountered that such experiments are not practicable and seldom used. The towing method for models, used in marine work, is also impracticable on account of the high speed necessary and the difficulties of obtaining still air. The wind tunnel method of testing models has proved far superior to any other method and has now been developed to a high degree of perfection and usefulness. The Institut Aérotechnique de l'Université de Paris at Saint Cyr has several wind tunnels for models, and also tests full sized machines and their parts. The Laboratoire Aérodynamique Eiffel is devoted exclusively to wind tunnel experiments and is the most elaborate in design.

The Deutsche Versuchsanstalt für Luftfahrt zu Adlershof is used for testing full-sized machines and their parts. The Göttingen Aerodynamical Laboratory has wind tunnels for tests of aeroplanes and dirigible models. The wind tunnel of the United States Navy Department at Washington is similar to that at the Göttingen Laboratory.

The National Physical Laboratory at Teddington and the Royal Aircraft Factory at Farnborough, England, constitute the most complete aeronautical station in the world. It not only tests but manufactures full-sized aeroplanes. The wind tunnel of the Massachusetts Institute of Technology was patterned after the best ones used abroad. It is used mostly for research work. (Later articles will continue the course.)

[Course in Aeronautics and Aeroplanes. Designs by A. Klemin and T. H. Huff, Instructors in Aeronautics, Massachusetts Institute of Technology. *Aviation*, Aug 15, '16. 3000 words. Illustrated.]

The slight variations of density of the air are so small that the air can be regarded as incompressible, and so for a dirigible moving 100 miles per hour, the increase in pres-

sure at the nose is only about one per cent. The density of the air varies from .07608 lbs. per cu. ft. at sea level to .0357 lbs. per cu. ft. at 20,000 ft. altitude. A man in a boat uses his oars just as much in remaining stationary with reference to the river banks in a current of five miles per hour as he does in moving his boat five miles per hour in still water.

The energy of a fluid consists of: (1) The energy due to its position in height through which it may fall; (2) the pressure energy and the energy due to its motion. The Pitot tube measures the velocity of flow of air and is used to measure the actual speed of the aeroplane in flight. The angle of incidence, always designated as "i," is the angle expressed in degrees between the relative wind and the chord of any supporting surface. The resultant pressure on the wing section is designated as "R." This resultant pressure may be resolved into the drag or force parallel to the relative wind and the lift or force perpendicular to the relative wind. The lift measures the sustaining power; the drag, the resistance to forward motion. The tangent of the angle between "R" and "D" is  $L/D$ , and the greater the value  $L/D$ , the greater is the efficiency of the supporting surface. The term center of pressure is unsuited for a combination of wing surfaces, the term resultant vector of forces is much better suited and should be used. The resistance of a plate normal to a wind is due to the difference in pressure for front and back of the plate. The formula  $R=KAV^2$  holds good for all cases of bodies producing turbulent flow,  $R$  being the resultant pressure,  $A$  the area in sq. ft.,  $V$  the velocity, and  $K$  an experimental coefficient. The minimum resultant force occurs when a plate is in line of the wind. The maximum pressure occurs when the plate is at an angle of about 40 degrees. At small angles the center of pressure is near the mid position and gradually moves forward as the angle of incidence increases. At zero degree of incidence the resultant pressure is 90 degrees behind the normal, rapidly approaches it at small angles and passes it at 10 degrees.

#### —Transportation of Supplies

[18,800 Pounds of Food via Aero. *Aerial Age Weekly*, May 29, '16. 340 words.]

To relieve the starving British garrison at Kut-el-Amara, British aeroplanes dropped 18,800 pounds of food, as well as mail and stores, in the town from Apr 11 to 29, according to the Under Secretary for War. During the whole siege, only one aeroplane was brought down by the Turks.

#### —Use of in European War

[Progress in Aeronautics. By Major H. Bannerman-Phillips. *United Service Mag.*, June and July, '15. 6000 words.]

"The use of aeroplanes for damaging railroads at critical moments, with a view, for instance, of preventing reinforcements and reserves being brought up during the progress of an engagement, has become a recognized tactical operation in modern war, the timing

of the attempt being in a sense more important than the actual extent of the damage done." The aeroplane work done about Neuve Chapelle proves this strikingly. Great damage was done to the railroad lines at Menin, Courtrai, Don, and Douai, while a wireless station at Lille was destroyed. Then, again, airships have proven most useful for sea scouting. When properly handled, they can be efficient against submarines. A fast-climbing aeroplane, well supplied with bombs, should prove a match for any airship built, since firing from a platform on top of same has been found unsafe. A heavier-than-air machine can overtake the dirigible and by maneuvering above can drop bombs on it. The apparently unsuccessful Zeppelin raids on England have an importance. They give practice to the crews and experience to the pilots; such trips test the efficiency of the English air defenses; they are of value for reconnaissance information for future raids; and the morale of the English civilian population is lowered, while that of the German people is raised.

The Sikorski biplane is an interesting type of machine, and is of purely Russian design. Its main qualifications are not so much speed as steadiness, power in the form of air-worthiness, and weight-carrying ability. All Sikorski machines are fitted with internal propellers. Previous to the war, Sikorski built an aeroplane known to have carried eighteen persons. The wood used in his machines is mainly Russian pine and beech. His success lies in dealing with the relation of strength to weight, the greatest problem in building machines of great span. If the span of a machine is increased and the number of bracing points kept the same, and also the same angles of the bracing wires retained, the size and weight of the spars must be increased proportionally for safety. This is due to the great strains that lightly built machines are subjected to in flight. Also, not only will the heavier spars increase the weight of the machine, but their weight, which may be necessary to carry the same load per square foot of supporting surface, will increase out of all proportion to the area. In order, therefore, to keep the weight low enough to bear a safe proportion to the area the number of bracing points must be increased in the same ratio as the increase in space of the aeroplane. But this method has its limits, and each additional wire adds to the resistance which a machine offers to the air when in flight. The load carried by the eighteen-passenger machine was only five pounds per square foot, in spite of the fact that the machine weighed seventy-five hundred pounds.

There is another aeronautical development of German origin which has distinctly justified its existence during the present campaign, and that is the captive kite-balloon, usually of the type designed by Siegsfeld and built by the Parseval Company. It was a familiar object at maneuvers on the Continent long before the war, and was used by both the Italians in Tripoli and the Spaniards in Morocco. It has the enormous advantage over the ordinary captive spherical balloon, familiar to the British

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public, as used in our service, in that it is actually steadier in a wind than in a calm, and is not so liable to cause seasickness as the ordinary globular aerostat, which sways and twists in a wind at the end of its tether at varying angles with the perpendicular in a way which not only produces nausea in the most hardened aeronaut or observer, but prevents any observations of value from being made. The kite-balloon gas-holder is tubular in shape, and the containing cordage and tethering ropes are so arranged that the pull is felt towards one end of the cylinder rather than in the middle, and it floats, consequently, at an angle of about 45 degrees with the ground. At the lower end it is garnished with a bent cylindrical air-bag which covers the end of the gas-container. The front of this air-bag is open to admit the prevailing wind, which passes through the interior and out again through a small orifice at the back. The car is suspended about the middle of the gas-bag by fairly long ropes so that it hangs well below the air-bag. The prevailing wind current or any gusts of wind fill the latter and pass out in a steady stream of air which keeps the balloon head to wind and quite steady, and at the same time pushes up the lower end of the gas-container towards the horizontal, reducing the wind resistance of the latter, and the tendency of the whole aerostat is to lift like a kite in the wind, whereas wind pressure in the case of a captive spherical balloon causes it to swing round at the end of its tether and sink nearer to the ground. With a little adjustment, the result in the case of the kite-balloon is to cause it to remain almost stationary and facing in one direction, so that the observer in the car below has a reasonably steady platform for observation at a far greater height from the ground than would be possible with anything else but an aeroplane or dirigible. A bird's-eye view from a couple of thousand feet obtainable in this way is likely to be so useful to an enemy's artillery that it is not to be wondered at that such observation posts form an object of solicitude to the opposing mobile aircraft."

The destruction of the German Zeppelin by Lt. Warneford demonstrated that the best defense against aerial bombardment is that of mobile aircraft. It is hard to operate anti-aircraft guns accurately at night. Although it may be impossible for local aeroplanes, say in London, to rise in spirals quickly enough to get above a visiting Zeppelin, as it can throw out ballast and rise vertically, yet by the time the Zeppelin approaches the coast on its homeward journey, the aeroplanes of the coast patrols and of the Expeditionary Force will be aloft and waiting for it. The Morane monoplane used against the Zeppelin at St. Amandsberg is known for its quick climbing power and general handiness, essential to a machine for such work. It is perhaps the best policy to let loose a number of these hornets against a Zeppelin rather than to use anti-aircraft guns against it in case of raids on large cities. It is a different problem from that of dealing with the enemy's aircraft ob-

taining information as regards positions and troops in the field. In this latter case, falling shells from anti-aircraft guns may be damaging to the enemy when close to our lines.

In the beginning of the war the aeroplanes that the British brought into the field quickly proved their superiority to those of the Germans. Lately, however, the Germans have advanced towards an equality with the British in this respect, due to their installation of higher-powered engines. This has made it necessary for the British to make similar developments to maintain their prestige.

One of the most interesting problems in aeroplane development during the war is the conflict between the necessity of weight-carrying ability and that of quick climbing. The requirements of fighting in the air have made weight-carrying qualities necessary. Nearly every machine must have some defensive arrangement, fire arms, or bombs, as well as field glasses, cameras, wireless equipment, etc. The slower types of machines, as evolved by Wright, of course proved best for such uses. Armor has also become necessary in order to ward off splinters of anti-aircraft shells. On the other hand, speed, climbing ability, and ease of handling were of vital importance to the pilot if he were to have a fair chance in maneuvering and fighting the enemy's machine. The demand for speed, climb, and life is becoming more and more exacting. The stable aeroplane in which the pilot can use his hands freely for purposes of offense and defense, for using his glasses, taking photographs, or even kneeling on his seat to look over the tail of the plane, has proved of the greatest value during the war. It was the only type of machine for which hastily trained pilots could be detailed—and pilots have to be trained in a minimum period of time.

[Progress in Aeronautics. By Maj. H. Bannermann-Phillips. *United Service Mag.*, Aug. '15. 5000 words.]

Much attention has of late been given to the study of stability and details of construction of aeroplanes. The National Physical Laboratory has added a 7 x 7-foot cross-section air channel with air speed up to 65 feet per second, which has enabled many experiments to be made as to models and materials, including fabrics for covering as well as design and strength of frames.

The war experience of the Royal Flying Corps has given point to these investigations, as the strain of flattening out after a steep dive is terrific and requires the best design and fabrics to withstand it. The conflicting items are weight and climbing ability. Without the latter, both machine and pilot may be lost.

The Germans have aimed at safety and automatic stability. These are valuable qualities, as they reduce the strain on the pilot very materially and give him an opportunity to devote some attention to observation. Easy control may enable a wounded pilot to escape. Nevertheless, the Germans are also aiming at speed and climbing ability, and reports indicate the construction of large machines with



eight engines geared in pairs to four propellers, two of which are sufficient to sustain the machine. This large machine is also reported to carry armor.

The Germans have used a ruse against British aeroplanes. When one is above their trenches and signals are observed, artillery fire is opened on some carefully chosen point behind the British lines as if controlled by the aeroplane above, in the hope of leading the British artillery to open fire on their own machine.

The Germans continue to build Zeppelins, and they certainly understand war both by land and sea. Furthermore, they do not waste money on useless equipment. Therefore, they know a use for their Zeppelins, and it is undoubtedly in connection with their navy. As naval scouts, Zeppelins have many advantages over aeroplanes, the main one being the fact that they can remain stationary over one spot. The Zeppelin has possibilities against submarines, and undoubtedly they are used in scouting for submarines off Heligoland and the German coast. The risk to the submarine is greater because a bomb need not score a direct hit. Its explosion near the submarine might damage the hull. Zeppelins have undoubtedly done much good service of which it would be unwise for the Germans to boast. But they must be used and housed at places inaccessible to aeroplanes.

Meteorological conditions are important in the flights of Zeppelins. The British government has ceased issuing weather reports, and the Germans have no means of securing this necessary information, a condition that undoubtedly handicaps the pilots heavily, making great caution necessary.

[Progress in Aeronautics. By Maj. H. Bannermann-Phillips. *United Service Mag.*, Oct, '15. 6500 words.]

On Sept 8, the Secretary of the Admiralty made public the fact that the expansion in personnel and matériel of the Royal Naval Air Service had made a reorganization of the Admiralty Air Department necessary. Rear-Admiral C. L. Vaughan-Lee has been placed in command, with the title of Director of Air Services. Commodore M. F. Sueter, C.B., has been placed in charge of matériel, with the title of Superintendent of Aircraft Construction.

(The brilliant record of Capt. G. W. Mappleback, Royal Flying Corps, killed while landing in a Morane monoplane near Dartford, is recited. Other instances of brilliant services are given. A chronological record of the Zeppelin raids from Dec 25, 1914, to Sept 8, 1915, is given, with comments showing that the resulting military damage was small, though terrorization of the inhabitants rather than military damage is the real object of these raids.)

Even at great altitudes, the danger to the crews of Zeppelins is as great from anti-aircraft guns as is the danger to people below from their bombs. To descend lower in these huge machines would be suicide. The true field for the Zeppelin is in scouting for the

navy. No aerial machine yet built, or likely to be built, can get beyond the range of terrestrial anti-aircraft artillery, especially when carrying explosives and supplies for a long trip. There is no end to the possibilities of artillery development, and the history of armaments is that no machine has developed as rapidly as have the instruments designed to destroy it or limit its efficiency. The Zeppelin must remain a night bird.

German, French and British aviators are agreed that to fly lower than 8000 feet is to court disaster, and as anti-aircraft measures improve in efficiency, this altitude must be increased. Few Germans are flying below 9000 feet. Reconnaissances can be effectively carried on, as it is possible to see cows in a field or wagons on a road from this altitude. But bomb-dropping from such altitudes cannot be effective, as a field 200 yards square looks about as large as a postage stamp from a height of 9000 feet. Add to this the fact that the speed of the aeroplane is 60 to 80 m.p.h., and the difficulties of accurate bomb-dropping become evident.

The public is disturbed because counter-measures against the Zeppelin raids have been ineffective. The reason for the ineffectiveness is obvious. The raids are made at night. It is useless to send up aviators, for they can see no better in the dark than observers on earth; and the vertical depth of the frontier is too great to allow effective aerial patrol.

All that can be done in the way of defense is to (a) watch for enemy spies who might assist by signals; (b) reduce the lighting of all objectives to a minimum; and (c) signal the approach of raiding aircraft to all stations provided with effective defense, and to police headquarters in threatened districts so that proper precautions may be taken against fire.

In time, allied raids against the places that build and supply the German aircraft may become effective. French official reports are quoted to show that large aero squadrons are now effectively raiding points along the German frontier.

An instance is cited of the use of a captive balloon for observation, and the ineffectiveness of fire directed against it. The German anti-aircraft artillery is increasing in numbers and in gunnery, so that aviators have to fly high and resort to tricks of flying to escape. By the more extended use of kite-balloons for observation in trench warfare, resources in aeroplanes, pilots, and trained observers would be set free for distant reconnaissance.

[Aeronautics. The Fifth Arm During the War. by 1st Lieut. J. B. Ussing, Pilot. *Dansk Artilleri Tidsskrift*, Sept, '15. 4490 words.]

Uncontrolled balloons and captive balloons are so vulnerable that before long they will be regarded as obsolete.

*Airships.*—At the outbreak of the war, Germany was the only power in possession of an air fleet. It consisted of about ten Zeppelins and an equal number of Parseval and Gross type.

A modern Zeppelin registers from 23,000 to 30,000 cubic meters, is 200 m. long and has a

**AERONAUTICS—Continued**

diameter of from 18 to 20 m. Three or four motors give the dirigible a speed of 75 to 90 km. per hour. The bombs are placed on heavy hooks in an open compartment in the middle of the cabin. Machine guns are mounted in the cabin or on a platform on the roof of the vessel.

The speed of the small airship is from 40 to 60 km. This is considered too slow, since they are easily affected by the wind and are an easy prey for the airmen.

Only the "Zeps" have been really efficient, but, as a whole, their employment has been a disappointment to the Central Powers, no results having been obtained against the enemy armies. Near the enemy, they operate only at night.

Besides ten airships of the non-rigid or semi-rigid types, France has four large cruisers under construction, viz., two "Astro Torres" and two "Clément-Bayard" of 23,000 to 25,000 cubic meters. They have been used mostly near the coasts for guard duty.

Russia has nine airships of from 2000 to 11,000 cubic meters, and had ordered three of over 20,000 cubic meters.

Italy has always been one of the leading powers in the domain of the air. The Forlanini type is an ingenious solution of the non-rigid system, the rigidity of the vessel being secured by "rope-trusses," which are automatically tightened when the body is filled.

**Aeroplanes.**—At the beginning of the war, Germany had 300 aeroplanes, one-third of which were monoplanes and two-thirds biplanes. Austria had one hundred, France about three hundred, and England one hundred. These numbers have been greatly increased. At the English-French front, the number is now estimated at about 1400. Russia has two or three hundred machines, but most of these machines were of French make and in bad condition. The number of pilots in Russia was insufficient, and mechanics were hardly to be had.

The models having the propeller astern are most used, owing to the better view obtainable and the better facility for using firearms.

The "Dorand" bi-plane is a real fighting machine, and has been named "Bauernschreck" (= the terror of the peasants) by the German soldiers. It has two propellers ahead, a partially armored gondola, two 100 h.p. Gnome motors, and a speed of 140 km. It is built in the military workshops.

In England, the Farman type is the most popular. A special English model, the tractor biplane, is very efficient and is much used.

The huge Russian Sikorsky biplanes have carried sixteen persons, but they do not seem to have played any important rôle so far.

**Reconnaissance and observation.**—The principal use of the aeroplane is in reconnaissance and not, as some writers would have us believe, in bomb-throwing. The elements have little effect on the activities of the aeroplane, as wind and rain have interfered very little. Fog, however, prevents them from being used. In order to avoid gun fire, the airmen on reconnaissance follows the lower edge of the clouds

when possible, dipping down when observations are to be made and returning quickly to cover when necessary. Reports are delivered either after landing, by dropping written messages, or by wireless. The last method is not much practised, as the sender is left in doubt concerning the receipt of his message.

In encounters between aeroplanes, the various parts of the machine often make the use of fire arms difficult or impossible. It is therefore important to know the models used by the enemy in order to be able to place one's self in such a position that the enemy pilot cannot use his weapons.

At altitudes up to 800 m., musketry fire is very dangerous; above 1200 m., the airman considers himself invulnerable to this kind of fire. As to artillery fire, it is quite the opposite; in the lower altitudes the speed of the aeroplane makes it very difficult for the gun to follow it, but from 1000 to 2500 m. the artillery fire is extremely dangerous. Range finders are necessary.

The probability of hitting is small, as it is necessary to hit a target of one square meter (pilot, motor, and tank) travelling at a speed of about thirty meters per second.

[Progress in Aeronautics. By Maj. H. Bannermann-Phillips. *United Service Mag.*, Nov, '15. 4500 words.]

Under date of Oct 4, Field Marshal Sir John French in an order of the day expressed to Brig. Gen. H. M. Trenchard, C.B., D.S.O., A.D.C., and all ranks of the Royal Flying Corps, his appreciation of their work in connection with the battle which began on Sept 25. This aviation work was done under adverse weather conditions, and Field Marshal French mentions in particular the plucky work of co-operation with the artillery, in photography, and in bomb attacks on the railways in rear of the Germans. An outstanding feature of the aviation work during recent weeks has been the number of combats in the air. These fights are of the most spectacular nature, and individual feats of daring in reconnaissance are also chronicled. Most of the encounters between opposing aeroplanes took place early in the morning or at about sunset.

The number of air fights chronicled during the month of September reached a total of 84, in the great majority of which the British airmen had the advantage. It is claimed that this is accounted for by the fact that the British temperament and mind are better suited to aeronautical work than are these qualities in the Germans. No claim is made that the Allied machines in general are superior to the German machines.

[Progress in Aeronautics. By Major H. Bannermann-Phillips. *United Service Mag.*, Dec, '15. 5500 words.]

From the reports of Field Marshal Sir John French covering the fighting of Sept 25, it appears that the Royal Flying Corps performed valuable work in spite of the heavy rain,—work which included distant flights behind the German lines, and bombing against

the railways. Mention is made of satisfactory progress of the co-operation of the artillery and air service.

The aeroplane work has gone on unceasingly, and the volume of work steadily increases. The amount of flying has doubled and there have been more than 240 combats in the air.

Artillery observation and photography are the most dangerous duties, as the aeroplanes must remain exposed to artillery fire for comparatively long periods, but the former is an important factor in artillery fire. One case is cited of an aeroplane hit in 300 places without being disabled.

(Here follows a list of decorations awarded to members of the Royal Flying Corps and a description of the gallant services thus rewarded.)

The Allied airmen maintain their supremacy, but there appears to be little doubt but that the German aviators are acting under instructions to run no unnecessary risks. From their conduct of war in other respects, it is certain that they have excellent reasons from their point of view for adopting this course.

With a view of securing superiority in the air, the Germans have turned to improving their machines. The result is a type of tractor biplane of 80 to 100 foot span driven by two Mercedes engines of 100 to 150 h.p. The engines are in two narrow fuselages, with a nacelle in the center at a lower level, containing seats for a pilot in the center and two gunners with machine guns, one in front and one in rear.

These aeroplanes remain aloft for six hours by throttling down the engines to the lowest limit, but are able to accelerate to tremendous speed when necessary. It is not impossible that the Germans are trying to improve on the "Fritz" type before turning out these machines in large numbers.

A German machine captured by the Russians is described as a biplane with two unusually large fuselages and two tails. Each of the armored fuselages contained "two machine guns and a light quick-firing gun," with ammunition lockers. The machine was driven by twin-engines of 170 h.p. each, and the pilot's armored nacelle was in the center. The crew consisted of pilot, observer, mechanic, and three gunners.

At the beginning of the war, the German aviation service was far more efficient than was suspected, but many of their best men have been lost, and those who remain are kept back for important occasions.

Apart from the aeroplane, the Germans attach the greatest importance to the Drachen balloon for directing artillery fire. This sausage shaped balloon is free from most of the disturbing motion suffered by the spherical balloon. The latter is so unstable as to make observation difficult. Even the sausage-shaped balloon sometimes makes the strongest stomach succumb to motion sickness.

In aeroplane construction, size adds enormously to the difficulties. There is great augmentation of the stresses and there is

trouble in securing spars of suitable lengths. The wide span offers some difficulties due to lateral inertia, but the size itself is some protection against gusts.

One difficulty in designing large machines is that the heavy weights must be confined to a small area so that the resultant forces will act upon one point or as nearly so as practicable. Large engines require large gasoline and oil tanks, and as fuel and oil are used, the balance of the machine may be destroyed by the shifting of the center of gravity. Two propellers offer the objection that if one engine stops the other must be stopped also and a glide commenced, on account of the torque due to one propeller alone.

The Sikorsky is a notable type of large machine. The "Ilya Murametz" (Sikorsky) of 1914 was 121 feet span, 9 feet between planes, 65 feet from nose to tail, lifting area 1950 sq. ft., with triple rudder of 55 sq. ft. It had two 200 h.p. Salmson engines, and was a marvellous weight-carrier.

In designing a large machine, if the number of panels in the truss remains the same, the size and weight of spars increases, and the weight of these spars necessary to carry the same load per square foot of supporting surface will increase out of all proportion to the area and much more rapidly than the load carried by the supporting surfaces. If the weight is to be kept down to a reasonable and safe proportion to the area, the number of bracing points must be increased in proportion to the span. But every added wire increases the resistance and gives more work for the motor. The "Ilya Murametz" (Sikorsky) of 1914 was a very successful design, for the load only amounted to five lbs. per sq. ft., even though the machine weighed 7500 lbs. and had a useful load of 2240 lbs. Unfortunately, the machine was very slow.

[Progress in Aeronautics. By Major H. Bannerman-Phillips. *United Service Magazine*, Jan, '16. 4000 words.]

One of the developments in the utility of mobile aircraft for naval purposes, totally unforeseen at the time when the use of heavier-than-air machines by naval officers was not encouraged, is their use in "spotting" for the ships' guns against objects invisible from the deck or fire-control station. The utility of the captive balloon in this respect is strictly limited, as it merely extends the vision over a greater horizontal area and is of no use against hidden targets on shore. The use of aeroplanes for observation of the targets of the monitors carrying powerful guns in connection with the attack of coast defenses is a novel development. Although the kite-balloon is of great value as being steadier than the spherical captive aerostat, it only gives the advantage of view from a greater height vertically than the fire-control station; whereas, mobile aircraft have the advantage of going within such distance of the target as to observe anything not under cover from its point of view.

The output in England of machines and accessories has increased considerably of late,

**AERONAUTICS—Continued**

and no difficulty is found in obtaining the required number of suitable candidates to replace casualties in the air service. Seven times as many aircraft as Great Britain possessed at the beginning of the war have been turned out, and the output has been twice doubled during the past four months. Aeroplanes are now being constructed provided with two engines each of 100 h.p., and plans for some with three such engines have been drawn. Most are fitted with guns capable of firing in all directions.

The most serious obstacle since rifles and machine guns have been used from aeroplanes of the tractor type, both in directing fire at an enemy ahead and as being a source of danger to the occupants, has been the propeller. Recently a device has been invented enabling a machine gun to fire between the blades of a propeller while in motion. The Germans and the French had used a complicated contrivance by which the gun was stopped by the propeller at the instant the field was obstructed by its blades, until the deflector propeller was suggested. "With the present method, the machine gun is in a fixed position behind the propeller, with its muzzle pointing forward just above the boss. In the case of a two-bladed propeller, in the course of one complete revolution, the period during which the arm of the propeller, instead of open space, would be opposite the gun muzzle, would be no longer than about 2 per cent—that is to say, if making 1000 revolution in a minute the gun, firing a continuous stream of bullets, would find no obstacle for  $58\frac{1}{2}$  out of the 60 seconds; in the other  $1\frac{1}{2}$  seconds the bullets would hit one or other of the two arms and scatter over the machine, damaging it or hurting the pilot, as well as, in all probability, breaking the propeller. To prevent this, each one of the propeller blades has a very small deflector at that point of the blade that is struck by the bullets, and this deflector—merely a small metal plate—turns the bullets off so that they pass through clear of the machine, but, of course, wide of their mark. This occasions no appreciable jar to the engine, and merely means the wasting of a small percentage of bullets. Thus if 100 bullets are fired in a minute, two go wild.

There are many calculations and shrewd guesses being made why Germany continues to construct Zeppelins. So far in the war they have proved of little efficiency. The labor and expense could be put into new aeroplanes to gain the supremacy of the air in that line. This supremacy now seems to be well in the hands of the Allies. Undoubtedly the German authorities know what they are about, and only time will reveal the answer.

[Progress in Aeronautics. By Major H. Bannerman-Phillips. *United Service Magazine*, Feb. '16. 2800 words.]

A remarkable stride has been made in 1916 in aeronautics, in that weather which is unfavorable for the operations of all arms except long range artillery is used for aeroplane

reconnaissance. Only a very thick fog will prevent the usual round of duty in the air over the trenches in France and Flanders. The handiness of pilots is greatly improved through the necessary use of cramped starting places and bad ground to land in which has at the same time increased the strain and risk. It has been unmistakably demonstrated that for skilled airmen a machine with automatic stability is a disadvantage; particularly where quick and delicate maneuvering is required does its steadiness become slowness and unwieldiness. Combats in the air have also increased, and vary from duels between individual machines to regular mêlées in which several aircraft are engaged.

Formerly it was judged that overhead reconnaissance could be carried out at from 4000 to 6000 feet altitude with safety in regard to the artillery, because of the height, the smallness of the target offered by the vital parts of the aeroplane, and the speed and difficulty of ranging with two dimensions, horizontal and vertical. Recently the German anti-aircraft gunners have so improved their practice that they burst their shrapnel with effect at over three miles vertically from the ground and up to 10,000 feet their shooting is remarkably skillful. At the same time the amount of flying to be done has doubled. In one of Sir John French's despatches he stated that from June 15 to Oct 15, 1915, it had doubled, and from published statistics of the French Air Service during the first six months of the war, airmen made 10,000 separate journeys for reconnaissance, spending 18,000 hours in the air and traveling 1,125,000 miles in that time. Journeys at 10,000—or even 12,000 and 15,000 feet—have become the normal ones and the strain on the human system is correspondingly increased.

It is not the rising to high altitudes and the exposure to lower temperatures which marks the strain, but the rapid variation in temperature and in atmospheric pressure. The machine rises in spirals and comparatively slowly in a vertical sense, but the descent is usually made not only at high speed in passing through the air, but according to the steepness of the angle of descent the variation of air pressure is proportionately more rapid and the strain more severe. Exposure to the cold may be met by sufficient clothing, but the oxygen helmet seems hardly to fit the latter case, especially as reconnaissance and fighting in mid-air are already so complicated. There is a presumption that the most favorable conditions will ensue if the rapidity and angle of a descent were made equal to that of the previous ascent, but it is obvious that the exigencies of the service will not permit this in reconnaissance, much less in combat. The casualty lists for 1915 show for the R. F. C. 57 officers and 14 men killed, 21 officers and 2 men missing; for the R. N. A. S. 22 officers and 2 men killed, 5 officers missing. These losses do not include the loss of life from accident or prisoners, so that the actual casualties considerably exceed that figure. In eighteen months' service, the number of

efficient fliers on the casualty list equalled the number with which the campaign was started.

The improvement in the efficiency of the latest Zeppelins in comparison to those constructed in 1915 is tremendous. Though difficult to believe they will ever rid themselves of certain inherent defects, some peculiar to themselves and others inherent to all gas-supported aerostats, the Germans have evolved a system of utilizing them with a view to their peculiarities. They have increased their speed in still air by twenty to thirty miles an hour, which enables them to maneuver with safety in winds which would formerly have kept them in idleness. Their size and lifting power have enabled them to actually perform such journeys as they were formerly credited with doing. They can rise to much greater heights and their sub-division into a greater number of compartments renders them less liable to damage from anti-aircraft fire. The disability of offering a large target still remains, however, and they are just as liable to accumulate a load of moisture in fog, rain, or snow, or a coating of ice at low temperature, which may bring them down to earth or within range of terrestrial artillery. These improvements have also increased the cost, and recent computations have placed the cost of a Zeppelin with full equipment for reconnaissance and bomb dropping at \$650,000 to \$700,000, and the shed for two at \$600,000. Germany has sunk a very considerable sum with, as yet, inadequate results. But in case of a raid, the material effect on London may possibly be more than negligible if opportunity should favor them.

[Study of Aviation Apparatus Employed by the Belligerent Countries. By Carlos Fernández, Military Attaché. *Memorial del Ejército de Chile*, Dec, '15. 5000 words.]

Since the beginning of the war military aviators are doing things formerly thought to be impossible, for example: (1) Reconnaissances, long and short; signalling battery emplacements, camps, advance of forces, etc.; (2) Result of your own artillery fire; (3) Communication between your own forces and transmission of orders; (4) Bombardment of troops, railroads, fortified and unfortified places. (5) Protection of certain places from attack by enemy's aviators; (6) Pursuit of enemy's aviators.

Hydroplanes render to fleets the same service as above.

There are three classes: the machine gun plane, armored, and equipped with one or more machine guns; the bombing plane, ordinarily a simple bi-plane with apparatus attached; the gun plane which carries a piece of 37 mm.

The machine gun plane is purely French. At the beginning of the war Germany did not have these. The reason appears to lie in the construction of the machines. The French put the propeller behind the aviator while the Germans put it in front. The Germans have mounted 3 rapid fire guns, 2 that shoot to the front—right and left, and one to

the rear. Formerly aviators carried automatic guns and pistols. In the case of the monoplane, before the solution as above was reached, various systems were used. The guns were placed high and the gunner standing was protected by an armor plate. Bullets that struck the propeller could not in any way injure the aviator. This was the system of Garros, to-day a prisoner in Germany.

At the beginning of the war France alone had especially armed apparatus for aerial combat. In June, 1914, Gen. Joffre reviewed at Villacoublay the aerial apparatus. The Dorand biplane was especially noted, 19 meters in breadth, weight about 1000 kilos, 2 motors 85 h.p. each drove the propellers. Velocity 100 kilometers per hour. Lifting capacity 500 kilos. Now these figures are all small.

As arms the French aviators carry shells (percussion and time), incendiary bombs, arrows (steel and incendiary).

The Germans had the Roland system of throwing bombs. It consisted of 3 tubes of fixed direction, worked by pedals of different colors. The grenades had the shape of a pear and were some 30 centimeters long and were both explosive and incendiary. An aiming apparatus enabled the aviator to tell when to drop his bombs, taking into account the height and velocity.

At present much more powerful projectiles are being employed. Some of the French bombs are more than a meter long and weigh 40 kilos.

The incendiary arrows have for their objective balloons; they carry a quantity of benzine and have a percussion cap. They are of the shape of a long pencil, weigh 17 grams, and are 12 cm. long. They are thrown from a height of 2500-3000 m. If they strike a man they will penetrate from the head to the abdomen. The French fire them in bundles of some 500 at a time. One aviator fired 18,000 in eight flights.

Germany has also adopted the arrows.

Germany, like all other nations at present, is employing all kinds of machines—not only the military type.

Austria's apparatus is the Lohner biplane and the Etrich-Taube monoplane, although now they are using quantities of German material.

England in general uses biplanes.

Russia besides a quantity of French material has a gigantic one which now has imitators in Germany and England. It measures 28 meters width, 4 propellers with Argus motors of 100 h.p. each; can carry 15 persons.

Italy has an aerial flotilla of French type.

Serbia has French.

The motors have undergone a complete change. They have developed from almost nothing to 200 h.p. each. The fixed type has gained a victory over the rotary one.

It is to be noted that raids are effected by squadrons which daily grow more numerous. At first only small groups of 3 or 4 were used, but at present the number rises to as many as 34, thus increasing the probabilities of securing results.

**AERONAUTICS—Continued**

[New Developments in Military Aeroplanes. *Aeroplane Destroyers versus Battle Aeroplanes.* By Ladislav D'Orsy. *Scientific American*, Feb 5, '16. 2500 words. Illustrated.]

Up to five months ago, the radical changes which had occurred in aeronautics in the first year of the war were: The disappearance of low powered machines and the monoplane; the mounting of a machine gun on scouts and bombing aeroplanes had become general; and the tendency was toward a large, high-powered, heavily armed "battle aeroplane."

The French type of battle aeroplane, the *avion-canon*, was a 200 h.p. pusher biplane, speed 80 m.p.h., mounting a 37 mm. quick-firing gun in front. The first of these machines were used in the defenses of Paris, and later machines were used at the front as escorts to bombing squadrons on raids. These *avions-canon* were successful from the start, even the most reckless bravery of German airmen being insufficient to compensate for their inferiority in armament.

About the same time appeared the German version of the battle aeroplane. This was a twin tractor Albatross biplane, with two 165 h.p. Mercedes engines, speed well above 90 m.p.h., mounting two Maxims, one fore and one aft in a central nacelle. A more advanced model had two 225 h.p. Mercedes engines, the nacelle was armored, and a third Maxim (some reports say a small cannon firing grape shot) was added to the battery. This machine, nick-named by the French "Arminius," caused unprecedented execution among the Allied aeroplanes, as they had no machines combining speed and armament to match the "Arminius." The French soon brought into action against it the Morane-Saulnier racing monoplane, faster by 10 m.p.h., the armament of which was a single machine gun built into the machine and aimed by steering. Driven by expert pilots, these machines gained success against the "Arminius" type, and it was withdrawn to the Eastern front to be used in the big drive against the Russians.

Then appeared the German "Fritz" type, a single tractor biplane of the Albatross and Aviatik makes, furnished with a 180 h.p. Maybach or a 225 h.p. Mercedes engine, giving a speed near 90 m.p.h. The "Fritz" type was capable of 10 hours' flight. It mounted two Maxims, both mounted to fire sidewise. Being fast and easily maneuvered, it ranged alongside an opponent for combat. Although not a match for the *avion-canon*, "Fritz" was superior to any one-machine-gun craft of the Allies except the Morane destroyers. Few of these latter were available, as they required pilots of very exceptional skill.

Before the "Fritz" could do much harm, the French produced its master in the Nieuport tractor biplane—fast, a good climber, very manageable, and of quick responsiveness—built on the lines of the British "tabloids" such as the Sopwith and Bristol. Its revolutionary characteristic was the emplacement of its gun on the top plane, the gunner working stand-

ing. This enabled the pilot to attack the enemy from below, a fact which cost the Germans a good many machines. The Germans later adopted this method of mounting, adding an automatic rifle that could fire backward. The latter weapon is rigidly fixed to a pivoted seat which can rotate 180°. The 165 h.p. Mercedes-Aviatik tractor biplane, armed as just described, represents the latest type of German aeroplane destroyer. In addition to the standard type, the Germans use another type,—the Fokker,—which is used only by a few very skillful pilots. It is a very close copy of the Morane destroyer. One model has a Oberursel-Stahlherz 100 h.p. engine, and another has a 165 h.p. Mercedes, the latter giving a speed of over 100 m.p.h. Like the Morane, the Fokker's machine gun fires through the armored blades of the propeller. The Fokker embodies climbing ability and controlled instability,—quick responsiveness to the controls. Only exceeding capable airmen can handle it.

The Fokker waits aloft until an antagonist is discovered. If of the fixed gun type, it dives straight for its victim, firing when in range. By making the dive slightly spiral, there results a cone of bullets. When close to the enemy, the Fokker comes up from behind so as to have the vulnerable targets,—pilot, passenger, tanks and engine,—all in one line. Fokkers which do not fire through the propeller attack from behind and below, where they cannot be reached by fire from the craft attacked.

The Fokkers were notably successful, having destroyed 16 British aeroplanes within a month; but they were much less successful against the *avions-canon*. On Jan 10, 1916, at Dixmude, a fight between three Fokkers and three *avions-canon* resulted in favor of the latter. Two Fokkers were destroyed and one *avion-canon* was forced to land on account of a pierced petrol tank.

The British have put in commission a few machines which have proven good matches for the Fokkers. Two fights on Jan 17, 1916, resulted in favor of the British machines.

Both the Fokker and the Morane are freak machines. Speed and climbing ability are gained by light load and a limit of about two hours flight. Hence they are not available for long range operations. The Germans are therefore working on the further development of the "Arminius" type.

Latest reports are that the Germans have constructed a huge battle aeroplane which was tested last November. It is said to have two 130 h.p. and two 225 h.p. engines, probably Mercedes make, and a speed of 110 m.p.h. The armament is four Maxims and bomb-throwers, and has a crew of eight men. It carries wireless and a searchlight.

The French Government is making extensive experiments with multiple engined machines. The first of this type, the twin-tractor Caudron biplane with two 80 h. p. Le Rhone engines is already in commission. It carries a wireless and is used exclusively for artillery observation. The latest aeroplanes

have power plants of 600 to 800 h.p. but details are not available.

[Progress in Aeronautics. By Major H. Bannerman-Phillips. *United Service Magazine*, Mar, '16. 3200 words.]

Up to the present time the only machines capable of long-distance raids are large rigid airships, against which the darkening of areas and the anti-aircraft defences are used to reduce the destruction. They are, however, powerless to prevent the airships from taking and maintaining a position over a given area and doing chance damage. The moral effect of the sight of an enemy's airship roaming unharmed is by no means negligible. Many Zeppelins have been lost because of adverse weather conditions, but of recent date pilots have received valuable meteorological information which enables them to select the best time for their oversea voyages and on many occasions to avoid what would otherwise have been a certain catastrophe, due to sudden unfavorable changes in the weather. Most of the raids in England have taken place on nights when there was little or no moon, and after the barometer has been very steady during the previous forty-eight hours. Their work in scouting alone has justified their existence and the constant increase in their manufacture. They provide the Germans with machines for oversea scouting and nocturnal air-raids on Allied countries to which the latter have nothing to oppose, since no semi-rigid or non-rigid airship has the speed, mobility, or endurance of the rigid Zeppelin, and aeroplanes are useless against them at night. The power of rising vertically is one of its well recognized assets. Its rapid movement, both horizontally and vertically, has been well demonstrated, but the effect of better directed projectiles has not yet been proved. The ever present need of England now is something to combat these Zeppelins under its chosen condition by night and on even terms. Local defences are, of course, necessary, but, however excellent and well-organized they may be, they are at best mere palliatives for a disease for which the only cure is the removal of the cause.

The question of passive defence against aircraft is very difficult and intricate, especially so by night and as aeroplanes have not the whip-hand of airships. England's measures of protection, though perhaps not working perfectly as yet, have nevertheless caused the raiding airships to maintain themselves at such heights as to render accurate bomb-dropping impossible, and they have therefore not done half the damage they would have done in the absence of these passive defences. However, the real defence should be extended beyond the coast altogether. Since the aeroplane cannot meet the airship on even terms at night, and since the anti-aircraft guns are useful only to keep the Zeppelins at such a height that accurate bombardment of targets is impossible, it is easily seen that the only effective defence is another vessel of the same type, but faster. Though the possession of such a

fleet would not prevent the enemy from attempting similar raids, they would be made at much greater risk than at present. Though as far back as 1913 the building of large rigid airships was recognized as advisable, the experimental vessels then under consideration have not since proved their value. The building of such a fleet presents three difficulties; first, England has not yet produced a single airship which has been a success; secondly, while building these airships one must also build hangars for them; thirdly, the training of crews and testing of vessels would take a considerable time. The best England can hope to do immediately is to cut at the roots of the enemy's air-power by incursions against his nerve-centers of airship production, housing and supply.

The aeroplane produced by the young Dutchman Fokker, and so much used by the Germans on the Western front, is very efficient as a purely defensive weapon. It resembles a Morane monoplane, but with very much superior engine power to drive it. Its unusually high engine-power, small wing surface, speed and ability to climb quickly, are its salient features, while its greatest merit from the aviator's point of view is that it is built for a specific purpose, the destruction of other machines by superior maneuvering, so as to enable the "man behind the gun" to use his weapon to the utmost advantage. The Fokker is unsuited for reconnaissance or bomb-throwing. Due to the fact that it is a small machine, with unusually reduced supporting surface, and little stability, its high powered engine drives it through the air at a tremendous speed, and enables it to climb quicker than any other machine hitherto opposed to it. It is not a dual-engined machine. The engine is understood to be a stationary one of 160 horse power, and the framework of the aeroplane is supposed to be made of a special light, tough steel produced in Krupp's works. Another machine introduced by the Germans is a heavily armored one, able to fly much lower than the average and enabling the observer to make more accurate observation than from the hitherto necessary elevation of 8000 feet or more. The French have been more enterprising and successful than the Germans in raiding points of military value with the aeroplane and their losses have been encouragingly slight. Their usual procedure is to send out slow, weight-carrying machines as bomb droppers, escorted by light scouting machines, whose duties are to guard the former. As the raids start from points unknown to the enemy they have, in addition, all the advantages of a surprise.

Two points in connection with a stronger air fleet are (1) the very limited use made of the heavier-than-air machine in overhead scouting for a fleet, and keeping up communication by wireless, and in spotting for ships' guns in action; (2) the immensely greater facilities offered by the use of the rigid airships for these duties. The airship can carry wireless apparatus of far higher power and longer range, can receive as well as send

**AERONAUTICS—Continued**

messages far better, and can keep station with a fleet with the greatest ease by day or night, which the heavier-than-air machine cannot do.

[German Air Attacks Over England. *Sphere*, Feb 26, '16. 600 words.]

In the House of Lords, Feb 17, Lord Kitchener defined the measures for meeting hostile air attacks. An arrangement with the post office is expected to give warning. Local officers are appointed to co-ordinate defensive measures. Formerly difficulty was experienced in securing anti-aircraft artillery, but it now has priority over other ordnance in manufacture, and these guns will be distributed to the best advantage. New aeronautic material is being provided. New garrison artillery units have taken over the new artillery defenses and the gunners have had practice against aircraft at the front. The naval gunners remain on their former duties with the defenses.

[The War in Europe. Note. *Army and Navy Jour.*, Apr 29, '16. 150 words.]

During March, according to an official French report, 31 German aircraft were brought down against aerial casualties amounting to 13 Allied machines.

[Progress in Aeronautics. By Major H. Bannerman-Phillips. *United Service Magazine*, May, '16. 3200 words.]

German airships navigate the air over Great Britain, under favorable weather conditions, for the most part with impunity. They have opportunities of causing considerable military damage and interfering with the output of munitions, besides killing inoffensive civilians. In addition, their possibilities of employment in conjunction with the German naval forces in attacks on merchant vessels, scouting and spotting for the High Seas Fleet, and in connection with the projected invasion of Britain, as military policy or desperation may suggest, are far more serious than the sensational uses to which these vessels have hitherto been put. England's only chance for freedom from air raids is the destruction of the enemy's hangars and of his aerial resources at the bases of production. Without these shelters, the construction of rigid airships for use with the German Fleet is useless, as they cannot exist without air-harbors in which to get overhauled, refitted, refilled with gas, and tuned up for each successive voyage. With only the seaplane and captive kite-balloon to scout for the fleet and spot for their guns, England is at a much greater disadvantage than Germany with the powerful Zeppelin, which can either remain and keep station above or close to the fleet or submarines with which it is ordered to co-operate, or follow a course parallel to a fleet and at such distance from it as to keep the latter informed of the enemy's movements by wireless in code, without either of the two opposing fleets being able to see each other.

The wireless installation on a Zeppelin will send up to 300 miles if required, and tapping messages in code would be of no use. When a fleet action comes, the Zeppelin can remain in close proximity and observe for its guns. For overhead scouting for the submarine, the Zeppelin is peculiarly suited, furnishing the latter with the information which limited range of vision denies to the U-boat, and it is far superior to the seaplane for this purpose, because it can suit its traveling pace to that of the submarine and keep station with it, however slowly it may be moving; whereas the seaplane has a minimum flying speed below which it must drop to the surface of the water, and when afloat its commander can see no farther than the commander of a submarine. Though in 1912 it was asserted that a German had produced an aeroplane capable of hovering, it has never materialized and it is doubtful whether any machine relying entirely upon aero-dynamic reaction for sustentation in the air, as well as in forward movement, will ever replace the airship for naval purposes.

The "America" flying boat originated in the United States, and the particulars of one of the latest specimens have just been made public. It is a huge triplane, weighing over nine tons. The motive power to lift this and force it through the air at over a mile a minute is to consist of six 160 h. p. water-cooled V-type engines, which are coupled in twin units of 320 h. p. to three 15-foot propellers; two of these are tractors, the third is a pusher. An auxiliary engine of 44 h. p. serves the three-fold purpose of (a) enabling the pilot to start the motive-power plant from his seat by means of an electric starter, (b) generating the current required for an automatic stabilizer and a drift indicator, and (c) for driving a screw-propeller under water when the flying boat has occasion to travel on the surface. The hull is of cedar planking, riveted to ribs of ash and sheathed with copper; the length is 68 feet, the beam 20 feet, and it is "stepped" and shaped underneath to enable it to navigate on the surface and rise off the water as may be required. In addition, it is divided internally into a score of water-tight compartments with a view to keeping the vessel afloat if the hull should be pierced by the enemy's projectiles. Within the hull are included (a) a conning tower containing the controls and navigating instruments, and (b) a cabin fitted for a crew of eight, which also contains the fuel tanks, ammunition, and other stores. The tanks have a capacity of 700 gallons of gasoline and 80 gallons of lubricating oil, quantities calculated to give a flying endurance of nine hours at an average speed of seventy-five miles per hour when fully equipped both for reconnaissance and for aggressive purposes. The supporting surfaces of the machine consist of three superposed planes, each of 133 feet span, and a chord of ten feet, with a gap of ten feet between each plane. The lower of the three planes is fitted with a pontoon under each tip to prevent the wing from sinking when the flying boat is running



on the surface of the water or riding at anchor. The steering arrangements include a balanced rudder of 54 square feet area, with a keel-fin of 46 square feet area. There is an automatic stabilizer, but provision is also made for transverse stability by interconnected ailerons hinged to the supporting planes, and for longitudinal stability by a non-lifting tail, consisting of a tail-fin with an area of 126 square feet and an elevator of 96 square feet. Even if both the twin engines driving the tractor-screws should break down, the third twin engine and the propeller should suffice to render the gliding angle of the machine so gentle as to give ample time to choose a suitable landing place, or even allow of repairing the other engines in mid-air before coming down to land. Though carrying a larger armament than the ordinary seaplane or aeroplane, it is doubtful whether it would make an efficient Zeppelin chaser, first, because although its rate of climbing has not been specified it would presumably be slow; and, secondly, its estimated speed of 75 miles an hour compares very unfavorably with heavier-than-air machines already in use by the Allies. For dealing with naval airships, it would be necessary to get above them in order to drop bombs, and the light and speedy scout machine of great climbing power would be more apt to succeed, especially in a combined attack with several of them. The rôle of the large and heavily armed machine would be to protect the bomb-droppers from attack by hostile aircraft and prevent the latter from interfering with the prosecution of the raid. Their greatest usefulness would be as coast patrols, where they could attack hostile aircraft at great range, and from the same level or even a lower height than the target with their heavier guns, against which the armor on the gondolas would be no protection. The American machines would be able to carry 3-pounder guns, and it would be possible to drive an invader into the danger zone of anti-aircraft guns on land or cause it to rise rapidly by discharging ballast and using its elevators and engine power at the same time. Most ballast is in the shape of bombs, and the more of these dropped promiscuously the less would remain for the intended raid. The incendiary bombs thrown during recent raids weighed about 60 lbs. each and the explosive 120 lbs. The limit of carrying power available in the latest Zeppelins is three tons, or 36 high explosive and the same number of incendiary; and in order to rise to a safe height from the attack of aeroplanes and the fire of anti-aircraft guns, an airship would have to sacrifice a considerable amount of ballast.

Unless deliberately rendered "live" by releasing the safety attachment, or if the automatic release by air-screw attachment during the fall from airship to ground has failed to act, a high-explosive bomb can bury itself in the ground without exploding, in spite of the impact. If the high-explosive used is troto or T.N.T., this may account for the fact. This substance is a fine yellowish crystalline powder obtained by the nitration of

toluol, a by-product of coal-tar, and dinitrotoluol. It is chemically stable and does not suffer from exposure to the air, and makers claim that it is superior in explosive and disruptive power to gun-cotton, that it cannot be exploded by even a rifle bullet at short range, and is the least sensitive to shock or impact of all known explosives, and that, if sufficiently compressed, it is impermeable to water, and therefore especially suitable to use in submarine mines.

The only aircraft likely to be required in any numbers for some time after, as well as during the war, will be for purely naval and military purposes. Any system which would tend to place the fulfilling of contracts in the hands of a few large firms, or which by restricting experimental construction to government factories or institutions, would starve out the smaller firms and render it difficult for men unendowed with capital to undertake the building of aircraft and the working out of new ideas. Capital must be attracted to airship construction as a paying investment, and by so doing England will not only be strengthened for war but will be on the road to developing the possibilities of aerial transportation in time of peace. An Air Ministry will find plenty to do in organizing the output of aircraft, co-ordinating the activities of all concerned in manufacture, controlling factories and labor, and regulating the supply and prices of raw materials, besides deciding on the choice of design, the award of contracts, the extent to which certain types can safely be standardized, and the amount of work to be carried out by government factories and private firms.

[The Use of Aircraft for Offensive Work in the European War. By Colonel G. Natalie, Engineer Corps. Italian Army. *Rivista Militare Italiana*, Apr 16, '16. 2500 words.]

From the very first I have contended that aircraft would never be used offensively with any success. It is true that they have been used to control the fire of the artillery and also to reconnoiter the enemy's positions. They have also been used to destroy railroad bridges and other stationary targets, but at no time have they inflicted any damage on combatants or on fortifications.

I do not believe that even the hostile aviators intended to do the damage they did to non-military public buildings, cathedrals, etc. In dropping a bomb from an aeroplane, the bomb may often miss its mark by 100 meters. It is this inaccuracy that causes the assertion that aircraft cannot be used on the offensive. This inaccuracy is due to a great extent to the speed through the air. The trajectory of fall of the bomb will depend on the speed of the machine, its altitude, and the direction and velocity of the wind. These three factors are very hard to ascertain while flying, and, consequently, the dropping of the bombs must be by judgment. I read sometime ago that Father Alfani, of the Observatory of Firenze, had discovered a method of dropping bombs accurately from aeroplanes.

## AERONAUTICS—Continued

Bombs may be dropped from dirigibles with much greater accuracy than from aeroplanes, because the former may remain stationary if the wind is not blowing. If the wind is blowing, the work is not so accurate. However, the dirigible must work rapidly, for it offers a wonderful target for the hostile artillery.

I am loath to agree with all the criticisms made against the Austrian aviators for damage done at Venice and Verona. It is very possible that the bombs that damaged the Church of the Scegli at Venice were intended for the Naval Arsenal nearby, or for some buildings of military value located farther away from the church. The bomb that damaged the Park of the Erbes in Verona may have been meant for the bridge over the Adige, or for some of the numerous military bureaus located in the city. In this latter place the bombs were dropped in an empty park and may have been intended to terrify the people and cause them to bring pressure on the authorities to end the war. This is the only plausible explanation to offer for the numerous raids on the English coast.

Our present laws relative to bombarding were made before the appearance of aircraft. They were made for the artillery, which could control its fire so as to keep from destroying public buildings not used for military purposes. New laws should be made covering the use of aeroplanes and submarines. They should not be allowed to drop bombs unless they can drop them accurately.

We should not place too much reliance, however, on treaties and laws when we deal with people who regard treaties as "scraps of paper," and who justify their violation of the neutrality of a country by saying that "necessity knows no law." At the end of this war we shall see which will prevail—right, or the brute power of a people educated according to principles opposed to morality and honor.

[McCulla Lectures at North Island. *Aerial Age Weekly*, June 26, '16. 1000 words.]

W. R. McCulla, Aircraft Engineer of the Packard Motor Co., recently returned from Europe, stated:

Because of the efficiency of the German anti-aircraft guns, it was fatal to cross the German lines at a speed of less than one hundred and thirty-five miles per hour, at a height of 6800 feet.

Any pilot of British service caught looping the loop is instantly discharged from the aviation service.

The new British biplane has a wing spread of 135 feet, and weighs, fully loaded, about 15 tons. It has four 350-h.p. motors, two tractors and two pushers, carries a crew of six men, and has a cruising radius of about 750 miles. The British reconnaissance machines have a speed of 135 miles per hour. No American machines are used on the firing line.

So accurate is anti-aircraft gun fire that rarely more than four or five shots are necessary to bring down an aeroplane.

In Paris, one man, fifty-four years old, passed the pilots' test. The average age is between twenty and thirty years.

[Aeronautical Notes. French Airmen on Russian Front. *Scientific American*, Aug 12, '16. 100 words.]

Berlin correspondents lay stress on the fact that French aviators are now flying on the Galician and Volhynian fronts, and that several hundred French aeroplanes have arrived along the whole Russian line.

[Two Years of Aerial War. By Claude Grahame-White and Harry Harper. *The Fortnightly Review*, Aug, '16. 7000 words.]

[The authors limit their remarks to the aeroplanes.—Ed.]

When the war broke out in 1914, the aeroplane had had no service record. Both fliers and machines were without war experience, and it was predicted by some that in a week, such machines as had escaped artillery fire would be worn-out, and aviators themselves would be nervous wrecks.

But this prediction was falsified from the start. In spite of the fact that air fleets were inadequate, organization and equipment experimental, and aviators without experience, the flying service, in the very earliest phase of the war, had a far-reaching effect on the campaign. First there was strategical scouting, gaining news of the enemy's disposition which it would have been impossible to get in any other way. On Aug 23, 1914, at Mons, the flying corps confirmed the news of the arrival of German masses seeking to envelop the British. On the other side, the German learned from their own service that the French offensives in Alsace and Lorraine lacked the strength in men to push them home.

The armies once in contact, the value of air-control of artillery fire immediately revealed itself. The Germans were the first to employ this method, and so thoro was their work, so helpless the [British] artillery to make any return that aeroplanes had to be sent up to drive away the enemy observers. Here the British had an advantage, thanks to their speedier machines and to the skill and daring of their aviators. The German idea had been to build a machine that would make the least possible demand upon the skill and endurance of the pilot; this idea was good, and the machines themselves were admirable. But these qualities had been obtained at the expense of speed and rapidity of maneuver; hence the Allies, and particularly the French, content with a lower factor of safety, and less concerned with inherent stability, provided themselves with speedier machines, more quickly maneuvered, than those of the Germans.

The point is that in war machines unnecessarily high factors of safety mean less

speed and ascensional power for any given horse-power, than would be the case with machines built more lightly. Under normal (peace) conditions these factors are necessary. A war pilot must feel, however, not that his machine is safe under abnormal stress unlikely to occur, but that when engaged he can fly at least as fast as his adversary. Efficiency must not give way to safety; both war and flying are essentially perilous, anyway.

It had been supposed that a need existed of military aeroplanes of exceptional strength, able to survive the rough handling of war. But experience soon showed that it was undesirable to have machines of this character; their weight, other things equal, was too great. Moreover, there is no such thing as satisfactory housing for aeroplanes, and no country had enough skilled men to keep at the front a force to undertake the repair of machines in use. Hence it was found more expeditious, and in the long run cheaper, to scrap aeroplanes and obtain new ones. If an aeroplane could survive, say two months of war, that was sufficient. For another reason, it is unnecessary to build machines to last a long time, because before they wear out, they will have been made obsolete by better ones.

It should not be assumed that the German military machines failed of their purpose. They had been built for long no-stop flights, and this purpose they fulfilled admirably. No one could tell in advance that they would prove less suitable for aerial fighting than Allied aircraft: indeed no one had foreseen that aerial fighting would prove so important. It was argued that hostile air scouts would avoid one another more or less, so that air combats took both sides somewhat by surprise. The determination of pilots, when range-finding for their artillery, had not been anticipated, and no one imagined that huge armies would lie facing each other month after month, with aircraft in daily conflict. This situation developed a general routine of war flying. Daily surveys were made of enemy positions, to detect his batteries and to observe his movements. Flights far beyond his front lines were needed to "spot" any shifts of reserves, to locate ammunition depots, to watch railway centers. Photography from the air was greatly improved, and wireless telegraphy developed, mainly to assure quick and accurate co-operation between the airman above and the gunner below.

It was then that aerial fighting grew in frequency from day to day, and the Germans, at a disadvantage at first because of their slower machines, were quick to make use of their high-powered engines, and of their successful adaptation of racing motor-car engines to purposes of flight. They built large fighting biplanes, able, even when carrying a pilot and two passengers, each of whom worked a machine gun, to fly fast and to climb fast. These machines were largely employed to patrol the air above their own

lines, seeking to check the penetration of enemy scouts, or to attack hostile machines engaged upon range-finding.

They cruised usually at high altitudes, swooping down on enemy machines which were on reconnaissance, and so compelled to fly lower. The difference should be noted here between a scouting machine and a fighting machine. So far it has been found impossible to design an aeroplane that shall be ideal in more than one particular. It may fly fast, it may be very stable, it may carry heavy loads, it may be excellent for observation. But it cannot be all these things at one and the same time.

The Allies suffered losses through the operation of defensive craft employed by the Germans to oppose reconnaissance, and also because of their use of small, high-speed, single seaters, in which the pilot also worked a machine gun. These monoplanes climbed high and they would dive over some enemy scout, go by behind him and pour a stream of bullets into his machine. It should be remarked, however, that this form of aerial duelling was originated by the Allies.

The Germans operated chiefly on the defensive: apparently they reached no such high average of scouting flights, made from day to day and under varying conditions, as did the British. This was because they no sooner ventured behind the Allied lines than they were promptly attacked, and with the utmost vigor. This, however, does not mean that they were driven from the air; it is true, however, that they found it too costly to persist in such reconnaissance, as the British were able to maintain. A factor of this question is that of temperament: apart from any question of machines, of luck, of courage, it would seem that the Allied aviators had greater dash, greater spirit, greater natural adaptability to the conditions under which aerial battles are fought. This German disadvantage perhaps has its origin in the German system of military training, which tends to rob men of their individuality. The chief task of the aeroplane has been since the outbreak of the war, that of reconnaissance. And here the Germans have been consistently inferior. Scouting aeroplanes must be protected by fighting machines. Of these there was for a time a serious lack, remedied later. Even so, the escorting machine is at a serious disadvantage as compared with the purely defensive machine operating over its own lines, from the greater load it must necessarily carry.

Offensively, the power of the aeroplane has grown from the beginning of the war. At first their real effect was more or less negligible; operating in twos and threes, and carrying low-powered bombs, incorrectly discharged, they merely tried the nerves of the enemy. But as more machines became available raids were organized of forty or fifty craft. Bombs grew in size, weight and destructive power: airmen increased in ballistic skill. Special weight-carrying biplanes were constructed and held in readiness in

**AERONAUTICS—Continued**

squadrons, equipped solely as bombing craft. These machines have already shown their fitness to co-operate with land forces in large offensives. Their special targets have been railways and railway stations, bridges, and even trains, at rest and in motion. More than once, the transport of enemy troops has been definitely impeded by these organized attacks upon points of strategic importance. And in all this kind of aeroplane work, the Allies have shown a conspicuous and undeniable superiority. Neither side, however, may be said to have secured the command of the air. The personnel of the service has been insufficient; the material side (stores, machine shops) undeveloped, skilled mechanics lacking in suitable numbers. In other words, no such thing as an aviation mobilization has been possible. The result was that in the earliest stages of the war, aerial reconnaissance went on unchecked by either side. In principle this is wrong. The whole theory of aerial warfare is that one fleet should, at the outset, obtain by defeating the main enemy fleet, the definite command of the air, and thus obtain for its own side an advantage that would be almost inestimable. Conceivably, one fleet might be so superior that the other would decline combat: hostile air raids would then become a factor and would have to be seriously considered. In this particular war it has been possible merely, and then only upon occasion, to win and hold some temporary superiority, by constant fighting over a limited area, and thus prevent enemy craft from entering it. This has amounted to the establishment of an aerial screen, like the cavalry screen on land, but far harder to maintain. An example is furnished in the withdrawal of the British army from the Aisne to a position nearer the sea. For days beforehand, the British air-men prevented enemy machines from crossing their lines. In general, tho, it is most difficult to make the screen in question impenetrable. Clouds may intervene. Moreover, the enemy may cross at a higher or at a lower level.

It is clear to-day that speed is of supreme value whether for reconnaissance or for combat. Speed alone, however, is not sufficient. There is no use in outmaneuvering and out-sailing an antagonist unless he can be put out of business or brought down. The effect of machine guns is uncertain. What is needed is a weapon specially designed for the conditions of aerial attack: a quick-firing weapon, light, powerful, and using small explosive shell. The ideal projectile in its turn, must be fuzed so sensitively that it will detonate on striking an aeroplane wing, and yet resist the shock of discharge, and the pressure of swift passage thru the air. The fighting aeroplane, which will increase in importance with time, presents a problem of complexity. It must raise loads, and yet weight counts. It must make long no-stop flights but must not lose speed or capacity for rapid climbing and maneuvering, else

it may be helpless at the moment of combat. It is possible that results may be obtained by using lifting planes. Design must be such as to reduce air resistance, and engines of many thousand horse power must yield a maximum of power with a minimum of weight, transmit this power efficiently to the propellers, and at the same time be reliable.

[The authors conclude by pointing out that it is Great Britain's duty to gain and hold the command of the air. They predict the construction of machines of speeds of 200 miles an hour and more; given these in sufficient numbers, a belligerent may in a few hours paralyze his adversary by destroying his communications, arsenals, factories, etc. Swift and pitiless as may be sea power, it is not to be compared under these heads with airpower.]

[Chat on Aeronautics. By Col. Et. Borel. *Revue Militaire Suisse*, Jan, Feb, '16. 11,500 words. 1 illustration.]

We shall consider only such means of navigating the air as are of practical utility. Those statically suspended are ordinarily called erroneously lighter than air, and those machines dynamically supported are called heavier than air. We intend to examine the machines as to their utility for observation and exploration, communication, destruction, and combat and shall divide them into two classes: fixed machines and mobile machines.

**FIXED MACHINES**

In this class are spherical and kite captive balloons, and kites themselves. They are used for observation and communication.

*Observation* was the first military end of aeronautics and that is understandable, because, theoretically, the view is extended at a height of 50 meters by 25 kilometers and at 1000 meters, by 113 kilometers, in all directions.

*Captive Balloons.*—They were used to reconnoiter enemy positions by Custine at the siege of Mayence in 1792.

In 1796, Bonaparte used balloons in Egypt. Their use was not very feasible, however, on account of the primitive methods of making hydrogen and the fact that they were held by gangs of men.

The use of illuminating gas brought improvements, so that we see them reappear in the Italian War. During the War of Secession in the United States, they were used with success, as well as at the siege of Sebastopol.

Their use demanded the solution of two problems: 1°, The stability of the basket; 2°, The tension of the cable had to be distributed over the whole aerostat. After improvement, the cable could not be subjected to an inclination of more than 45 degrees. In other words, the balloon cannot go up, if the wind is blowing more than ten meters a second (about 22 miles an hour). The length of the cable has to be considerable (1000 meters).

*Kite Balloons.*—The more violent the wind, the more it tends to push a spherical balloon down and the more surface is offered to the wind by the latter on account of its becoming

deformed; a kite, on the contrary, has a tendency to rise and to come nearer the vertical. Taking this fact as a basis, the German engineers, Parseval and Siegsfeld, invented the kite-balloon, the sausage.

For all captive balloons, the cable must be so composed as to break more easily than the system of attachment to which it is fixed, so that the aeronauts may be carried aloft by the aerostat, in case of rupture, and not brought to the ground with the basket.

**Kites.**—The Chinese used them, it is said, for military purposes in the year 200 B. C., but they were lost sight of as such a possibility and, until the beginning of the 19th century, the kite remained a play thing.

(Follows a page of history of kites.)

On the 18th of May last, a lieutenant and two non-commissioned officers were able to rise and observe at 650 meters above the ground, unaided except by the wind. This near the entrenched camp of Toul.

Not manned, kites are used for signaling. They can be used to carry wireless antennae and also for taking photographs. Manned, they are excellent for use in discovering submarines.

**Communication.**—All these fixed machines may be used for signaling, hence for communication.

In the coast zones of maritime countries where winds are more or less regular and on great plains, in Russia notably, they may be used two-thirds of the year. They are used by the Russian, French and English armies.

The drawback to fixed machines is that the objects observed are seen in perspective only.

#### MOBILE MACHINES

These are free spherical balloons, dirigible balloons and aeroplanes.

Free aerostats were used for the first time for the purpose of destruction at the siege of Venice by the Austrians in 1849.

In 1870-71, during the siege of Paris, communication was established between the besieged city and the rest of the country by means of free balloons. But the free balloon, once having left the city, could not return to it except by a marvelous combination of circumstances. The succeeding experiments were unsatisfactory until explosion motors appeared and enabled considerable power to be developed without the weight of the engine being prohibitive.

Military dirigibles are of several types in each belligerent country. In France, all except one, the Spiess, are of flexible type like the Fleurus, Lebaudy, Astra, Clément-Bayard, and Zodiac.

At the beginning of the war, England had only an Astra Torres of a special model, a medium-sized Parseval and some small dirigibles intended to be transported deflated to her colonies.

Italy had six non-rigid dirigibles and two Forlanini semi-dirigibles.

Germany's fleet was composed of rigid Zeppelins and non-rigid and semi-rigid machines of the types M. Gross, Schutte-Lanz and Parseval.

The relative cubic contents of the French and German are: France, 116,600 cu. m. in 14 dirigibles. Germany, 249,100 cu. m. in 17 dirigibles.

(Follows a description of the Zeppelins.)

The attempts on the English coast prove that they can cover 1200 km., and it is estimated that each Zeppelin could carry 750 kg. of explosives. They are obliged to carry considerable ballast in order to maintain themselves at an altitude of 2300 m.

It can be seen then that they are obliged to operate at night, because at 2000 m. they are a target for artillery. They make 75 km. an hour as against 110 by aeroplanes, so they can be easily pursued by the latter.

But dirigibles have over aeroplanes the advantage that neither the stopping of the motor, nor the loss of a propeller nor the death of one or several persons involves its destruction.

Their vital part is the envelope. If it is perforated and there is loss of gas, the dirigible is forced to land. If projectiles cause an explosion of the gas, it goes to smash.

The rigid is superior to the non-rigid type because the former can always steer and besides, can mount machine guns for defense on top.

For chasing Zeppelins, it seems that the English are building small dirigibles of wooden frame, capable of going 66 km. an hour and firing an aerial torpedo. They are to be driven by two light motors, and their radius of action will be 120 km. In the meantime, aeroplanes do not fail to chase the Zeppelins and sometimes with success.

**Aeroplanes.**—Aeroplanes can stay aloft only by constant mechanical power. It was only about 1904 that the lightening of motors gave the Wright brothers the means of flying 200 m. A track was necessary for starting.

In 1908 Farman resolved the problem of turning.

In 1910 the unfortunate Chavez crossed the Simplon.

In less than nine years, aeroplanes have become military machines; they have a radius of action of 150 km., and their distance record is 1010 km. in 13 hrs. 17 minutes, 29 seconds.

In France, efforts of builders tended to a lightening of the whole apparatus. The construction of biplanes was almost wholly abandoned for that of monoplanes.

It was not the same in either Germany, Austria, England, or Belgium, where preference was with reason given to biplanes. Let us notice here that, when war was declared the Belgian Army alone had been wise enough to choose the type of aeroplane best answering military needs, the Farman biplane.

As far as *observation* is concerned, mobile machines are superior to fixed apparatus in that the field opened to their investigations is not limited, theoretically, except by the duration of the flight. Speed being unfavorable to observation, dirigibles are, in that regard, superior to aeroplanes.

From the point of view of *communication*, dirigibles and aeroplanes have all the means

**AERONAUTICS—Continued**

that fixed aerostats do and have, besides, the faculty of moving; they are therefore preferable.

As to *destruction*, the rôle of fixed machines is almost nil. Among mobile machines, those of less speed are best suited to enterprises of destruction, and the more rapid are best qualified for combat.

**DIRIGIBLES**

Dirigibles are not intended to follow armies, because they are forced to return to their base. That they do not always succeed in getting back is proved by the following accidents to German dirigibles; Maestricht, Nov 25, 1914. Jutland Coast, Feb 19, 1915; Tirlmont, Mar 3, 1915; North Sea, April 5 and 12th and May 26, 1915.

The German dirigibles seem to have had bad luck from the beginning of hostilities. If the newspapers may be believed, out of 12 Zeppelins, only five were left on Sept 3, 1914. Friedrichshafen was, however, turning out one dirigible every three weeks.

From the beginning, English aviators have operated with great energy against German dirigible stations. The reason may be sought in the projected Zeppelin raid on Great Britain, planned for the beginning of Jan 1915. The Germans had hangars in Belgium with this in view.

There are dirigible bases at Cuxhaven, Heligoland, Düsseldorf, Cologne, Metz, Potsdam, Dresden, and Leipzig.

From a military point of view, the most apparent result of the 28 raids on England was the increase of volunteer enlistments in the British army.

Rain and snow overload Zeppelins to such an extent that they cannot stay up. This fact probably explains some of the North Sea disasters.

The French dirigibles have not been inactive; they have bombarded a number of storehouses and stations. The only loss is the "Alsace," bombarded and brought down near Rethel.

Besides their raids on England, German dirigibles have bombarded Antwerp, Ostend, Bielostock, Plossk, Warsaw, Libau, Nancy, Calais, and Paris.

English dirigibles have convoyed transports of troops and material across the channel and have carried on an efficient patrol service in the North Sea. They have been valuable for the discovery of submarines. No losses have been reported. The Italians have lost one dirigible; the Germans, it is said, 23. We believe this figure to be exaggerated by more than half.

**AEROPLANES**

At the beginning of hostilities, aviators flew relatively low, as a result of which quite a number succumbed to infantry fire. Aeroplanes were then furnished with armor underneath to protect the essential parts.

At the start, aviators worked alone or in pairs, their chief mission being reconnaissance.

Thus, on Aug 23, 1914, aerial reconnaissance developed the fact that there was not a very

large force left between the French frontier and Mulhouse. The Allies were informed of the German strength and direction of march in Belgium by aviators.

The incursions of German aviators over Paris at the beginning of Sept had another object than the moral effect; their principal mission was to report daily what had become of the reserve army of Paris. It was thanks to these flights that the Germans knew that this army was marching towards the north and that it was deploying facing east.

In the course of the battle of the Marne, a French aviator discovered the gap between two of the German armies and contributed thus to the French victory.

It was thanks to aviators that the Germans were able to stop the empty trains sent out at full speed from Antwerp to damage their transportation.

Aviators were so active against railroads that most movements of troops in trains took place at night.

The Germans gained an early advantage by capturing Reims, a military aviation center. They claim to have taken ten Maurice Farman biplanes, 20 monoplanes, 30 or forty motors, and much repair material.

In the early period of hostilities, the war of maneuver, reconnaissance was, as we have seen, the chief rôle of aeroplanes. The mission was generally to find out whether sectors of ground were occupied by troops and by what kind of troops and in what strength, their directions of march, etc., in short, everything which was going on behind the front.

When the operations settled down to trench warfare, there was an improvement in the armament of aeroplanes. Machine guns were installed, and aerial combat became more frequent. The mastery of the air was necessary to protect the lines from aerial attack.

Aerial photography began to be very important, for it enables good maps to be made of unmapped regions. A map was made of Gallipoli from 35 photographs taken from Morto Bay to the Gulf of Saros. By this means, sometimes, objects can be located which have escaped the eye. A striking example: on the eastern front, in Poland, a German aviator returned from reconnaissance without having discovered some Russian troops whose march was known to the general staff. Developed photographs showed two foggy zones, indicating Russian bivouacs in the forest.

Photography is valuable for locating emplacements of heavy artillery, parks, bivouacs, etc. But it would be an error to think that photography alone can locate artillery targets accurately enough. The Germans use a signal bomb leaving a persistent trace upon which the artillery opens fire at once. The firing observed by the aviator was then regulated by signals made to the battery.

The French adopted this system. Their custom had been to describe large circles about the target as a center. Angular measurements by two observers placed at different points determined three points of the circular flight.

One aviator, communicating by wireless was able, in a single flight, to regulate the fire on three different targets.

It is advantageous to keep aviators attached to the same sector, so that they can at once notice any change in the enemy's dispositions in this terrain that has become familiar to them.

They are obliged to make frequent flights, at heights relatively not great in order that they may observe to some purpose. They are the target of infantry and batteries, unless the latter prefer not to disclose their positions by opening fire. Frequently they are engaged by enemy aviators. It is, therefore, advantageous to have them accompanied by a machine armed for the chase, which flies above them and can swoop upon the adversary before whom the reconnoitering aeroplane takes flight.

The shelling of Dunkerque will be remembered.

The heavy gun that did the firing from a great distance was discovered by aviators, and careful regulating of fire put it out of action.

In the present period, there is an almost uninterrupted line of trenches from Belfort to the English Channel, with captive balloons here and there. Aeroplane patrols cover this whole line, and squadrons of battle airships are ready in aviation parks about 10 kilometers from the line of trenches. These latter aid the reconnoitering machines to fulfil their mission by keeping off the aviators of the enemy defenses and protect their own front against the enemy's investigations.

They are useful in preventing re-enforcement, which they do by bombarding lines of communication beyond the reach of artillery fire. Heavy aeroplanes carry a considerable load of explosive or incendiary projectiles; they are armed with a cannon and machine guns.

Raids by single aviators having been found to give uncertain results, the Allies adopted the method of sending whole squadrons.

The first expedition of this kind was on Feb 12, 1915. Thirty-four English aeroplanes and hydroplanes achieved much success in a bombardment of coast batteries and hangars at Ostend and Zeebrugge. While this was going on, eight French aviators above the aerodrome of Ghistel prevented the German aviators from going up.

As many as 60 planes have taken part in raids of this character, and one of the raids was upon Stuttgart, 220 km. from the French lines.

A striking use of aeroplanes for other objects was the maintaining of communications between the garrison of Przemyśl and the field army and even with Cracow, aeroplanes entering and leaving the besieged city.

All machines are not adapted to the same uses. They may be classed as:

Reconnaissance and observation aeroplanes needing only defensive armament.

Combat aeroplanes armed with machine guns.

Bombardment aeroplanes, armed with cannon (37 mm. in general) and with machine-

guns, and furnished with a stock of shells and bombs (90 and 155 mm. in France).

All, without distinction, are supplied with grenades and bombs.

Bombardment aeroplanes are not necessarily giant aeroplanes, but the present tendency is towards the construction of those gigantic machines, of which one of the first types was the Russian Sikorsky. These machines are armed with a cannon and two machine guns. In France, they are of the triplane type and have a crew of six men.

At the beginning of hostilities, the French aviation service used aeroplanes of all makes, monoplanes and biplanes. Later, they used only biplanes. It is said that no fewer than 30 squadrons of Blériots and 30 of other type monoplanes have gone into the discard, that is, 360 plus 200 reserve machines. A single type of monoplane, the Morane-Saulnier, was kept as a pursuing aeroplane on account of its great speed, and it was furnished with an automatic rifle firing through the propeller, the blades of which were protected by a V-shaped arrangement that deflected bullets.

The biplane types are the H. Farman, M. Farman, Caudron, and Voisin. The Farmans are used for observation; the Caudrons, as artillery aeroplanes on account of their speed in ascent and their faculty of landing in a restricted space. The Voisins are used for throwing bombs. All are armed with machine guns.

The Russians have used Farmans, Blériots and Nieuports from France, Wrights and Harlans coming from England and Sikorskys

In England, Vickers, Grahame-White, Bristol. All biplanes are used in the army, Avro and Sopwith in the navy. The United States are supplying some.

The Germans use Aviatik, L. V. G., Albatros, and A. E. C. biplanes, Fokker monoplane.

In Austria we find only biplanes, the Lohner, remarkable for its quickness in rising, and some German makes.

Motors of 100 to 120 h.p. have replaced the 80 to 90 h.p., universally used at the beginning, or else there are two motors. The general tendency is, or has been, to replace revolving motors by fixed ones.

In all the belligerent countries, pilots are trained in great numbers and do guard in the second line before being sent to the front.

[Progress in Aeronautics. By Major H. Bannerman-Phillips. *United Service Magazine*, July, '16. 3600 words.]

Germany is now, from a naval point of view, in a much worse position than ever before; England can tighten the blockade to the point of strangulation so far as sea-borne supplies are concerned; all prospects of a successful invasion of Great Britain are wiped out, and Germany must have lost all hope of using her mercantile marine during the course of the war. It is interesting to note the use made by both sides of their aircraft before, during, and after the great battle off the coast of Jutland. The advantages of the rigid airship

**AERONAUTICS—Continued**

for scouting purposes in clear weather; and its superiority, as regards spotting for ships' guns and sending back news by wireless, over the sea-plane, owing to the latter's limited radius of action, difficulty of rising from the sea, and keeping station with a fleet, are self evident. The one superiority possessed by the sea-plane is its ability to go up in weather which would be dangerous for a Zeppelin. It was necessary for the British to send out cruisers of offensive power as scouts, for light cruisers might be driven in without obtaining information, thus running the risk of losing ships and crews to no purpose; whereas the heavily-armed cruisers can act in the manner of a reconnaissance in force on land, and obtain information by fighting for it. It was a common assumption that the German Naval Staff, acting on well-laid plans, had succeeded in drawing the British battle cruisers into an engagement with a far superior force in gun and armor and had taken advantage of this to inflict a severe blow on England's navy, withdrawing swiftly under cover of night before counter-attack could reach them. The heavy mist may have prevented the aircraft in general from exercising overhead reconnaissance; but it is possible, in the case of the German airships, that the observer's vision could pierce the mist and thus see the British Main Battle Fleet coming up in support, thus giving the German fleet time to disengage from close action. A mist of no great depth may shut out all view of objects from the sea-level, and yet not serve as a screen from one whose line of vision passes almost vertically through it from above. Since the German fleet withdrew as soon as they found themselves opposed to the British Main Fleet, they could not have come out with the expectation of meeting the latter and must have been misinformed by their aerial scouts.

Those Zeppelins which attempted to intervene as bomb-droppers were promptly driven off in a damaged condition by the British anti-aircraft guns; others hovering over the ships at night, using their searchlights, were as promptly disposed of. The presumption is that the conditions of visibility were such as to neutralize, to a very great extent, the value of airships as spotters for the German Fleet. The German fire, though very accurate at first, deteriorated after feeling the effect of the British salvos. This may have been partly due to the fact that their aircraft were damaged in the course of the fight.

Among other improvements in the Zeppelin, are the adoption of a fish-shaped, instead of a cylindrical envelope; an increase of size, together with the lengthening of the envelope as compared with its girth in previous models, and a simultaneous increase in the number of separate gas-containers; the increase of the h.p. developed from 3000 to 4000. The steering-apparatus has been so improved that the vessel can turn on its axis in 30 seconds. The armament has been increased, and Unge air-torpedoes of great size and range are carried in addition. In one fish-shaped Zeppelin the

number of separate gas-containers has been reduced to three, lightening the structure considerably, affording more useful lift, and enabling it to rise to altitudes beyond the reach of all but the most powerful anti-aircraft artillery.

In regard to the "super-Zeppelins" the useful load may be supposed to have increased, but this cannot be the case to any great extent except when they are employed on work at very short range. Designers have had to take into consideration recently the necessity for increased armament. They carry two small guns and machine-guns, special launching apparatus for bombs and aerial torpedoes, besides wireless, smoke-producing apparatus, searchlights, and arrangements for mounting guns on the upper surface of the envelope. Larger planes and rudders give the rapid upward thrust which is so necessary when aeroplanes are in pursuit. The gondolas are said to be steel plated. The useful load and bomb-dropping capacity of a Zeppelin do not increase proportionately with the increased defensive, offensive, navigating, and other qualities of the airship itself. Aeronautics have profoundly modified strategy by land and sea. By extending the range of observation and report, concentrations and movements may be detected and checked, a thing more probably true of military campaigns than of military operations. Naval tactics seem to be unaffected, though undoubtedly airships working with a fleet in favorable weather may yet enable the enemy's formations to be discovered. To the navy aircraft are chiefly useful for scouting and observation purposes, and are really cruisers of a new type.

The bombardment of air-men by anti-aircraft guns has now attained such accuracy that it is difficult to realize that less than two years ago the aeroplane would have been considered immune at an altitude of 4000 feet. Soon after the beginning of the war nothing under 6000 was found to be safe, and it was not long before the Germans, by concentrating their attention on the subject, improving the material, and giving the gunners plenty of practice, proved that no airman could travel over them below 10,000 feet and remain safe, while even at 15,000 feet the range was not so safe as to allow of leisurely flying.

[The Aerial War in the West. *Sphere*, Aug 12, '16. 700 words. Illustrated.]

The Allied aviators have gained the ascendancy in the west, an important fact in connection with the Allied offensive. The Germans still have large numbers of Fokker monoplanes in France, but the Allies have faster machines of better climbing powers. Both machines and pilots are improving.

Wireless telegraphy for aerial work is being improved so as to make it a practical means of communicating with the heavy artillery and thus directing its fire.

Anti-aircraft artillery and gunnery are improving. Hits have been obtained at altitudes of nearly 20,000 feet. Night flying is increasing, especially for raiding in rear of the



enemy's lines. A French pilot recently flew a Nieuport machine across Germany via Berlin, and got to within 80 miles of the Russian lines.

The kite balloon is nearing the end of its day. Recently at a time when their help was badly needed, the Germans had no "sausages" aloft. At the same time there were fourteen in the air behind the Allied lines.

[Aeronautics. By Jose Paulo Fernandes, Captain of Artillery. *Revista de Artilharia*, July, '16. 3000 words.]

(A sketch of the present state of aerial warfare in Europe; the author finding his principal difficulty in compiling a simple sketch from the vast amount of material at hand, confines himself to a brief review of facts, leaving the reader to draw his own conclusions.)

[How Aeroplanes are Used in War. By Correspondent. *Land and Water*, Aug 24, '16. 2300 words. 3 diagrams.]

This article describes the use of the smallest type of airship. The business of the "little" aeroplane is to be mobile, to climb quickly, turn quickly, dive quickly, recover quickly; to secure quickness, all other qualities are sacrificed to the limit of risk. The functions of this machine are notable. It does not go over the enemy's land, it carries no bombs, no cameras. It waits for the enemy's aeroplane, either on the ground, springing into the air at 1000 feet per minute as soon as it is in view, or else it waits on high, at 10,000 or 14,000 feet, and from these altitudes pounces upon the enemy. It has a fixed machine gun arranged so as to fire through the disc of the propeller. The airman aims the gun by pointing the whole machine. There must be the lightest weight engine with the largest h.p. (generally from 100 to 150). There are two types, "tractors" and "pushers." The former has the propeller in front, the latter has it in rear. The "tractor" is capable of more speed and a quicker climb than the "pusher." The "pusher" has the very important advantage of offering good fields of fire and fields of view forward to the airman. As to the personal safety of the flyer "little" aeroplanes offer the greatest "aeroplane risk" and the least "gun fire risk."

[Progress in Aeronautics. By Major H. Bannerman-Phillips. *United Service Magazine*, Aug, '16. 3600 words.]

The destruction of the German kite balloons by rockets from the fast Nieuport scout aeroplanes seems to have been a particularly pretty piece of work. Reaching a height of 8000 feet, the pilot of one of these tremendously fast little machines makes straight for his victim in a bold dive. He is seen coming, and an endeavor is made to haul down the vulnerable observation-platform before it is too late. His descent is too quick to be anticipated, however; he gets within range, while the bulky aerostat is still swaying from side

to side as it answers to the pull of the windlass below, and presses a button which discharges eight rockets in a bunch, one of which at least is pretty sure to attain its mark. Then with a quick vertical bank, he rushes once more upward to clear the target and get quickly out of reach of the protective anti-aircraft guns, which are meanwhile pumping destruction at him for all they are worth. The French officials stated that their aviators, during the artillery action preparatory to the offensive, set fire to thirteen captive German balloons and two on July 1st, or fifteen in all.

English and French aeroplanes so far have usually confined their offensive attacks to raids on the enemy's railway stations and other nerve centers on the lines of communication. There was one exception during the early part of the Battle of the Somme, when a German battalion, while marching to the battlefield, came under strong machine-gun fire from one of the English machines flying at an altitude of only 300 feet above the country occupied by the enemy. The use of small airships for certain well-defined military and naval purposes, not for long distance naval reconnaissance, has been a feature of the present amphibious war, and may well be extended in future operations. It is obvious that it would be inadvisable for such vessels to travel far from their base; hence wherever there is a railway transport available on the line of communication of a field force or along a coast line which is to be patrolled by such dirigibles, their usefulness will be very considerably increased, if they can be housed in temporary shelters and refilled from hydrogen-generating plants which travel by rail.

At the battle of Jutland the efficiency of the naval branch of the air-service is shown by the fact that twenty-three minutes after the order to send it up had come from the flagship, a seaplane had been got out, lowered to the water-surface, and from there had risen into the air and was well on its journey of reconnaissance. Owing to clouds it was necessary to fly very low, and in order to identify the enemy light cruisers of which the pilot and observer were in search, it was necessary to fly within 3000 yards of them at an altitude of only 900 feet, the light cruisers meanwhile opening on the seaplane with every gun that would bear.

[Extraordinary Air Raiding. *Army & Navy Jour.*, Oct 7, '16. 800 words.]

Fourteen or fifteen Zeppelins raided England on Sept 24, resulting in the death of 38 and injury of 125. Two Zeppelins (L-32 and L-33) were brought down. One fell in flames and the crew was killed. The crew of the other was captured. Seven Zeppelins were in the raid of Sept 25, in which 36 were killed and 27 injured.

There has been extraordinary aeronautical activity on the western front. The French report 56 aerial combats on Sept 22. The British lost 5 aeroplanes and Berlin reported

**AERONAUTICS—Continued**

11 hostile aeroplanes destroyed.

Bucharest was bombarded by hostile aeroplanes Sept 25, and a Zeppelin flew over the city the same night. Ten Zeppelins raided over England on the night of Oct 1. One of them was destroyed.

[Aviation Notes. *Army & Navy Jour.*, Oct 21, '16, 100 words.]

The German military authorities report that 74 hostile aeroplanes were shot down during the month of September, 21 of which were French and 53 British.

[Editorial. *Army & Navy Jour.*, Oct 28, '16. 250 words.]

The French operations under Gen. Nivelle at Verdun Oct 24 illustrate the importance of the command of the air. Before the attack, the aviation department was directed to make a minute study of the German positions and dispositions. Not only was this done, but the German airmen were prevented from getting any inkling of what was going on behind the French lines. Gen. Nivelle used about 80,000 troops in the assault and achieved a brilliant success.

See also

FOKKER MONOPLANE  
JUTLAND, BATTLE OF—DIRIGIBLES IN

—Use of in U. S.—Mexican Expedition, 1916

[No Aeroplanes for Mexican Campaign. By Henry Woodhouse. *Flying*, Apr, '16. 5700 words. 5 illustrations.]

The United States forces are advancing in a strange country without air scouts, without aerial eyes, blind and unprotected. We had no aviators at the border to watch the movements of the Mexican bandits when Columbus was raided on Mar 9. The aero corps, whose equipment consisted of only eight biplanes with 90 h.p. motors, was stationed at Fort Sam Houston. These machines did not have sufficient power to carry the load required or to climb fast in case of emergency. Three of these machines left Columbus for Casas Grandes on Mar 19 and were not heard from until Mar 22 when two arrived at their destination. The other one was located three miles south of Ascension by a motor truck train. This machine had been there for 48 hours. One machine was smashed on Mar 21. The others were used to establish communication between the troops in Mexico and their base when the radio would not work and the wires were cut. The distance covered was about 230 miles. One machine made the remarkable time of less than 2½ hours for 165 miles. On Mar 27 the Secretary of War stated that only two aeroplanes were still in commission. On the same date a board was ordered to inspect, test and buy eight 160 h.p. machines. Since that date the remaining machines have been destroyed. (Note: Then follows a statement of aviators and National Guard officers who volunteered for aviation work.)

[The Expedition into Mexico. A Record Flight. *Army and Navy Jour.*, Apr 15, '16. 200 words.]

Lieuts. Gorrell and Dargue, Signal Corps, made a continuous flight of 350 miles from near Satevo, Mexico, to Columbus, N. M., duration 4 hours and 10 minutes. The flight was made under adverse conditions due to altitude.

[No Aeroplanes for Mexican Campaign. By Henry Woodhouse. *Flying*, May, '16. 1900 words. One illustration.]

The twelve aeroplanes just ordered for the army are just enough to equip four aviators. The United States with 20,000 miles of coast line, a visible wealth of \$188,000,000,000, and over 100,000,000 people to be protected, has no aerial protection whatever. According to semi-official statements from Washington, "Manufacturers are unable to furnish aeroplanes as rapidly as the War Department is ready to take them." The cross-country non-stop flights now being made will not be exceptional if the specifications of the War Department are met by the manufacturers of machines. These specifications require a continuous flight of not less than six hours, while the European standard is only three hours. Our aviators in Mexico have done some excellent work in scouting and message carrying. There are flights of one hundred to two hundred miles every day, with an occasional flight of over three hundred miles, all starting from an altitude of seven thousand feet above the sea. On one reconnaissance flight the aviators ascended from Columbus, which is four thousand feet above sea-level, to an altitude of seven thousand feet and made a flight of over four hours. In another case an aviator was forced to land twenty miles from his camp in the mountains. The next day a train load of Carranza soldiers passed, and apparently to test their marksmanship some of the soldiers opened fire on the aeroplane.

**AEROPLANES**

See

AERONAUTICS

**AFRICA**

See also

BRITISH EAST AFRICA

**AGA LIGHT**

See

SEARCHLIGHTS (Article: "The Aga Searchlight")

**AGE LIMIT**

—For Officers

[The Boy Officer. By Col. Robert Holden Mackenzie. *United Service Mag.*, Oct, '15. 3500 words.]

Without discussing the wisdom of having boys enter the military service, some who have entered the service at tender age have developed into brilliant leaders. In former times, appointment of even infants in arms as officers of the army on pay developed into an abuse, but this was abolished about 1800. The Royal

Navy still serves to show that the entrance of boys into that service is attended by the happiest results.

Among the principal qualifications of leaders of men are physical and moral courage, determination, and a strong sense of duty. Incidents are quoted from the careers of celebrated leaders to show that these qualities have been manifested at an early age. The examples quoted indicate that there need be no fear that the character of a boy in after life will be prejudiced by an early severance of school ties.

[European War. Age of the More Important Generals. *Les Annales*, May 21, '16.]

French: Joffre, 64; Castelnau, 65; Foch, 65; Langle de Cary, 67; Pétain, 59; Dubail, 65; Villaret, 64; Roques, 60; Humbert, 55; Gouraud, 47; d'Espérey, 60; d'Urbal, 50; Hély d'Oissel, 56; Dubois, 64; Maud'huy, 60. Average, 60.5.

British: Haig, 55; Plumer, 59; Rawlinson, 52; Monro, 56; Allenby, 55; Pulteney, 55; Ferguson, 51; Byng, 54; Alderson, 57; Wilson, 52; Haking, 54; Gough, 46; Birdwood, 51; Hunter-Weston, 52; Lord Cavan, 51; Keir, 60; Fanshawe, 56; Moriaud, 51; Snow, 58; Congreve, 54. Average, 53.9.

German: von Scholz, 65; von Fabeck, 62; von Eichhorn, 68; Leopold of Bavaria, 70; von Woerysch, 69; von Linsingen, 66; von Böhmer, 64; von Hindenburg, 60; von Mackensen, 71; Albrecht of Württemberg, 51; Prince Royal of Bavaria, 47; von Heering, 66; von Einem, 63; Crown Prince, 34; von Strantz, 63; von Gaede, 64; von Falkenhause, 72; von Kluck, 70; von Beseler, 66; von Bülow, 70; von Below, 63.

Counting the princes, who are generals in name only, the average is 63.5; excluding them, 65.7.

[Permanent Commissions. New Age Limit for Army Examinations. *Army and Navy Gazette*, Aug 19, '16. 500 words.]

In accordance with the Military Services Acts, Army Council instructions fix the age limits at date Dec 1 for entrance, with the object of qualifying for a permanent commission as follows: Royal Military Academy, Woolwich, between 17 and 19; Royal Military College, Sandhurst, and training colleges in India, between 17½ and 19.

The only exception is in the case of a candidate who is serving and has served satisfactorily in the Royal Navy, Regular Army, Special Reserve, Indian Army, Reserve of Officers, Militia, Territorial Force, or the forces of the Overseas Dominions. From these sources a candidate fulfilling all other conditions and recommended by his C. O. for appointment in the regular army, may be admitted up to the age of 25 (but 23 for admission to training college in India).

Recruiting officers will not call to the colors a youth who gives evidence of his intention to compete at the November Army Entrance Examination with reasonable chance of success. This exemption holds good

until announcement of the result of the examination about Jan 15, 1917.

#### AGUA PRIETA, Battle of

[The Battle of Agua Prieta. By Colonel Abner Pickering, 11th Infantry. *Infantry Jour.*, Jan, '16. 1400 words.]

This battle is unique in that it afforded the maximum observation from the side lines with the minimum of hazard to the observers.

General Villa attacked Gen. Calles, who was intrenched immediately on the international boundary line. The attack had to be delivered parallel to the intrenched line, as no deliberate firing across the line into the United States was permitted, and United States troops manned their trenches to enforce this provision.

Villa's attack began about one a. m., Nov 2, and was abandoned during the night of Nov 3-4. His artillery fire was poor. The advance of infantry skirmishers was very good and close to the ground. His machine guns were exceptionally well and bravely manned. The attacking force seemed to be well in hand, and everything was very orderly.

Our own soldiers in their trenches received a practical lesson in a professional way. Some trenches were within 60 yards of the volume of fire, and all could observe the attack almost to its details.

#### AIRCRAFT

See

AERONAUTICS

#### ALCOHOL

See

MOTOR TRANSPORT—FUEL FOR

#### ALIENS (Enemy)

See

WAR—TREATMENT OF ENEMY-ALIENS IN

#### AMBULANCES

See

SANITARY SERVICE—TRANSPORTATION OF SICK AND WOUNDED

#### AMERICAN REVOLUTION

See also

ANDRE, MAJOR

#### AMMONAL

See

EXPLOSIVES

#### AMMUNITION

See

BULLETS

CARTRIDGE CASES

DUM-DUM BULLETS

EXPLOSIVES

FIELD ARTILLERY—AMMUNITION

MUNITIONS

—Materials for

[Why Muscle Shoals Wants Government Nitrate Plant. *New York Times*, Oct 29, '16. 1700 words quoted.]

At various times since the end of the nineteenth century the attention of science has been turned to the world's supply of nitrogen. Sir William Crookes, the English chemist and economist, was one of the first to announce

**AMMUNITION—Continued**

that the world's food supply was dependent upon the availability of nitrates to replace the nitrogen taken from the soil by the process of agriculture. In 1905 Professor Robert Kennedy Duncan of the University of Kansas, in his book "The Chemistry of Commerce," described the relation of nitrogen to life and declared that "the working, building, 'vital' thing, the thing that is the moving spring of protoplasm and that brings about the continuous adjustment of internal to external things that we call life, is the versatile, restless nitrogen."

At the same time, Professor Duncan pointed out that the United States and other countries, their agriculture and their industry, where "wholly and implicitly dependent upon a tiny little strip of land in a South American republic and upon the grace of the 'Nitrate Kings' who own it; and were the little republic to close her gates of export, hungry mouths and insurrection would follow as infallibly as the night the day." He gave warning of a greater danger than this—the exhaustion of the saltpetre beds of this little Republic of Chile, the sole source of natural nitrates, in about twenty years from the time he wrote, or about 1925.

In 1911 the Department of Commerce and Labor sent one of its investigators Dr. Thomas H. Norton, to Europe to study the process of fixing the nitrogen of the air in order to provide an assured and more economical means of supplying agricultural and industrial needs. Dr. Norton made the report of his investigation, which occupied practically an entire year, in the form of a monograph entitled "Utilization of Atmospheric Nitrogen." In this he restated the importance of securing new sources of nitrogen. The bread eaters of the world, he declared, were increasing faster than the production of foodstuffs. His remedy was similar to that suggested by Sir William Crookes—the application of larger quantities of nitrogenous fertilizer to the soil, in order to increase, as far as possible, the yield of each acre. Dr. Norton found that European countries had developed the air-nitrogen industry to a remarkable extent, that they were taking out of the air, by electro-chemical methods, the nitrogen which constitutes 78 per cent. of its volume, and were making this material supply them with a large part of the nitrates needed for cheap fertilizer and for industrial use in the great number of nitrogenous compounds which chemists have developed for the use of man.

When the European war began, a new aspect of the nitrogen situation presented itself to America. Army officers had made an estimate of the amount of nitric acid which would be needed in a modern war—this was exceeded 100 times. It must be remembered that nitrates are required for every pound of ammunition, from the bullet fired by the infantryman to the contents of a mine or a big shell. The United States is dependent for

its supply upon the air-nitrate plants of Europe and the saltpetre beds of Chile. It can easily be imagined with what little trouble an enemy would prevent us from obtaining more than a tiny fraction of the nitrates we should need in war. The army has been trying to accumulate a reserve sufficient, but, according to the reported statement of a high official of the War Department, the entire amount on hand in this country would last, in such a conflict as the European war, "from 8 o'clock to 10:30 o'clock the same morning."

The army officers declared it was absolutely necessary that the country should provide itself with a great plant for producing air-nitrogen. When the annual convention of the State and national officers of the Farmers' Educational and Co-operative Union of America and national and State officers of the National Grange Patrons of Husbandry was held in Washington last February, resolutions were adopted calling upon Congress to authorize the construction of an air-nitrogen plant to supply the needs of military defense and of agriculture. After a time Congress decided to make the necessary appropriation, and the bill, as passed, provided \$20,000,000 for the construction of a plant, to be operated by the government, all details of the process and of location to be left to the President.

The President has turned over these matters to the Secretary of War, who has called upon the American Academy of Science to aid in deciding which of several processes used in Europe is best for American conditions. It is well known that Norway has made a success of the arc process, because that country has great waterfalls, which provide hydroelectric power for as cheap as \$3 per horsepower year. We have nothing like this in our country, and hence it is probable that a method involving the use of more expensive electric current will be adopted.

One member of the American Academy's committee, Dr. L. H. Baekeland, who is also a member of the Naval Consulting Board, has declared that the air-nitrate project is a valuable means for making military preparations a benefit in time of peace, for the same plant that will produce the 180,000 tons of nitric acid which it is estimated will be required each year in time of war, will also produce great quantities of low-priced fertilizer, one of the country's greatest needs.

Army engineers are in charge of the work of selecting the location. They are keeping in mind two things, principally—the recommendation of the War College that the plant be located at a great distance from the seacoast or border, in order to render it secure from an invasion, and that it be established, preferably, between the Allegheny and Rocky Mountains. There is also the need of finding a location where an enormous amount of power can be produced at low cost.

One site where a sufficient amount of power can be obtained is at Muscle Shoals, in Northern Alabama, on the Tennessee River,

which was the subject of five years of investigation by a special board of Army Engineers, of which Brig.-Gen. Dan C. Kingman, former Chief of Engineers, was a member. This board reported to Congress that there was a minimum of 120,000 horse power always available, and that for ten months a year the power amounted to 680,000 horse power. This could be developed at a cost of \$9 per horse power, or two mills per kilowatt hour, making it one of the most economical power sites in the country. After the report was rendered, Congress was asked to provide for the development of this power under a plan that would also result in opening the Tennessee River for navigation the year around, from Knoxville to the Ohio River, thereby giving water traffic to a section that contains wonderful natural resources. This request was denied at the time.

Included in the resolutions of the two farming organizations named above was a clause that is expected to be a factor in the question of location. It is as follows: "We insist that the location of this air-nitrate industry be determined with reference to the agricultural interests of the country and that a site be selected which has near it a source of limestone, coke, and phosphate rock, as has been recommended by the Department of Agriculture, and that, furthermore, if possible, it be selected closest to the greatest consumption of fertilizer." Limestone and coke are two important materials used in making fertilizer from air nitrogen, and phosphate is desired because nitrogen and phosphate can be combined to form ammonia phosphate, another valuable fertilizing product.

Muscle Shoals is located in a region of limestone rock which is 99 per cent. pure carbonate of lime, while the place is within 130 miles of the Birmingham coke district, the country's second greatest source of coke. It is also within forty miles of the phosphate field of middle Tennessee. With this combination, according to the advocates of Muscle Shoals, a plant can be established to supply fertilizer to the cotton-growing States, which use 60 per cent. of the fertilizer now sold, and, because of its location and transportation facilities, it can deliver fertilizer throughout the Middle West at low rates.

From the military standpoint the region is well provided with raw materials. The Birmingham district has grown rapidly in steel and iron production, while copper mines with a large output are to be found at the headwaters of one of the Tennessee tributaries, at a distance of about 400 miles. Aluminum is another metal widely used in military manufactures. All of the aluminum ore in the country is obtained from mines in Arkansas, Georgia, and Tennessee, within distances not exceeding 300 miles. Cotton, of course, is required in making gunpowder, and the advantages of having the nitrate plant located in the cotton-growing region is being urged by those who favor this site. Also the largest deposit of fluorspar, which is used

in fluxing iron and aluminum, is near Muscle Shoals.

See also

METALS—USE OF IN EUROPEAN WAR

—Supply and Transport of

[Mechanism of Ammunition Supply. By Eduardo Pellen, Lieut.-Colonel of Art., Portuguese Army. *Revista de Artilharia*, Dec, '15. 3500 words, 1 table.]

A description of the organization of the Ammunition Supply Service in the Portuguese Army, and its co-ordination with other services.

See also

FIELD ARTILLERY—AMMUNITION—SUPPLY SERVICE

—Use of in European War

See

EUROPEAN WAR—AMMUNITION

ANDRE, Major

[The Ethics of Major André's Mission. By Col. C. DeW. Willcox, U. S. A. *Journal Mil. Ser. Inst.* Nov-Dec, '15. 4500 words.]

[In this address, the author first sets forth the importance of the position of West Point to the American cause in the Revolution, in order that André's mission may be weighed in relation with the events of which it forms a part. After a brief statement of what constitutes espionage, he concludes that André was only technically a spy, but that even if he had been acquitted of espionage, he was nevertheless for other reasons given, properly condemned. But this condemnation was a matter of policy, and carried with it no infamy.]

ANGERBERG, Battle of

See

TANNENBERG AND ANGERBERG, BATTLES OF

ANGULAR TRAVEL BOARD

See

COAST ARTILLERY—RANGE FINDING—ANGULAR TRAVEL BOARD

ANIMAL PESTS IN WAR

[The Minor Horrors of War, *The Army & Navy Gazette*, London, Jan 8, '16. 300 words.]

In addition to the vermin and bloated flies which infest the trenches in France, there is now reported from the British trenches a plague of voles (field rats) which, due to the non-cultivation of the fields, fall into the trenches in great numbers, are trampled by the men and then devoured by beetles.

This plague is now being succeeded by one of giant rats, some of which measure nearly two feet in length. To combat these, ferrets in great numbers are being sent over from England.

ANTI-AIRCRAFT ARTILLERY

[The Exterior Ballistic Problem of the Anti-Aircraft Gun. By G. J. N. Carpentier, *United States Naval Institute Proceedings*, Jan-Feb, '16. 6700 words, charts, tables and diagrams.]

In this highly interesting and scientific article, which does not readily admit of condensation, the author proposes that the present automatic compensating device for eleva-

**ANTI-AIRCRAFT ARTILLERY**—Continued  
tion in the anti-aircraft gun be definitely abandoned. (His mathematical discussion which then follows is too long to be reproduced here.)

He then proposes a new method of attack and defense against aircraft, using a double gun mount, the two guns having a permanent angle of divergence of  $1^\circ$  in elevation and  $20'$  in deflection. With these guns, the proposed system of firing salvos, etc., it is claimed that the following advantages will result:

1. Great probability of sending at least one projectile of the salvo through the  $525 \times 46$ -foot airship, should it come within the ranging distance of the gun.

2. Great probability of bringing down from the critical space in a few salvos any aircraft, and almost a certainty of at least preventing them from crossing a given zone.

3. Great economy in ammunition. It can be stated conservatively that one salvo of four projectiles will be worth fully twelve rounds fired consecutively.

4. Great simplicity of the sighting apparatus.

5. During firing there is no need of chart, transit or any other cumbersome instruments, and no computation.

6. The duty of the battery commander, instead of being a Chinese puzzle, becomes no more difficult than in direct firing.

[Zeppelin Problems. *Arms and Explosives*. Mar 1, '16. 1300 words.]

As was shown in an article appearing in a previous issue, the great altitudes at which Zeppelins fly and their other incompetencies have reduced their chances of making a hit on a worthy target to a minimum. But as the matter of height affects the enemy's bomb-dropping, so does it affect adversely the work of our artillery.

The aerial target presents a problem in three dimensions—a target which moves not only in range and direction, but can also rise and fall. In addition there are the factors of diminishing atmosphere and of unknown currents of wind.

The anti-aircraft gunner's first task when the target comes into view is the estimation of the range. The necessary elevation is then given the gun. The projectile is inserted in the chamber, the fuse having been properly set. While these operations are going on, a change in range and height of target is taking place, and it would be a very lucky first shot which would make a hit.

Projectiles of the shrapnel and high-explosive varieties are used. Obviously a shell which did not break up in the air would be capable of causing damage on its return to earth. Tracer shells, which emit a flame, are used from time to time to afford information as to the correctness of aim.

Many plausible inventions designed to help the anti-aircraft gunner have been suggested. One idea is to use a pyrophoric shell. This shell is of ordinary pattern and emits a shower of sparks from its base. The idea is

that if the shell penetrated a Zeppelin it would ignite the hydrogen gas in the gas-bags. It is believed, however, that while the shell was making its ingress and exit there would not be sufficient time for the sparks to ignite the gas.

The results which have attended the efforts of our anti-aircraft gunners, so far, have been very discouraging, but experience must have its effect in improvement of shooting, and more powerful high-velocity guns will be forthcoming, so that great things may be expected in the event of future raids.

[Anti-Aircraft Guns. *Scientific American*, June 17, '16. 1200 words.]

Mr. Lanchester (English aeronautical expert) says rifle and machine-gun fire are wholly ineffective at 7000 feet, and 8 or 9 second time of flight would make aiming very uncertain.

Anti-aircraft guns fire almost vertically projectiles weighing 8 to 40 lbs., to a height of over 20,000 feet. They are usually mounted on armored motor cars for mobility.

Anti-aircraft firing is very inaccurate, hence numbers are employed to compensate.

The German guns are: 71 mm., firing 20 to 25 shots per minute, shell weighing 11 lbs., vertical range 19,000 feet; speed of motor car 60 km. per hr., climbs grade of 1 on 5, with 12 mm. armor; submarine anti-aircraft gun, 3.5 in. caliber, 20 to 25 shots per minute, muzzle velocity 2500 f.s., weight of projectile, 20 lbs.; Krupp, 6-inch, firing 35 lb. projectile discharging smoke trail, is mainly used by coast defenses and by the Navy.

The Ehrhardt factory at Düsseldorf makes various anti-aircraft guns, of 2-inch to 6-inch caliber.

The most remarkable of these is of 2.6-inch caliber, weight of projectile 9 lbs., elevation  $75^\circ$ , muzzle velocity 2000 f.s., vertical range 17,500 feet. Three classes of projectiles—shrapnel, smoke shrapnel, and "balloon grenade"—are used. This gun is mounted in an armored car, weighing complete about seven tons.

The Skoda Works, Pilsen, Austria, makes a 1.5-inch gun with a muzzle velocity of 3000 feet per second, weighing complete about 1350 lbs. It can be carried on any high-powered motor car.

[Anti-Aircraft Guns. By E. A. Ramos da Costa, Captain of Artillery. *Revista de Artilleria*, Mar, '16. 4000 words, 9 illustrations, 1 table.]

(A brief technical description of the principal German guns for use against aeroplanes, including their mounts; from data obtained before the outbreak of the present war.)

See also

AERIAL ARTILLERY

DIRIGIBLES

EUROPEAN WAR—SUBMARINES IN

SMALL ARMS—ANTI-AIRCRAFT FIRING

(Article: "The German Surrender")

Germany

[Aeronautics. A German Anti-Aircraft

Gun. *Scientific American*. Apr 29, '16. 100 words.]

The Germans use the Krupp 104 mm. anti-aircraft gun. Length, 45 calibers; weight of projectile, 34 lbs.; muzzle velocity, 2500 f.s.; range in height, 12,500 feet; rate of fire, 15 rounds per minute. The shrapnel bursts into 625 fragments. Such guns are mounted at Ostend.

[Foreign News. *Aerial Age Weekly*, May 8, '16. 1750 words.]

The German anti-aircraft gun is of Krupp make, caliber 104 mm., 45 calibers long. The projectile weighs 15½ kilograms, has a muzzle velocity of 800 meters per second, and reaches a height of 4000 meters. The gun can be fired at the rate of fifteen shots per minute, and its shell breaks into 625 fragments. A new Aviatik biplane has a 170 h.p. Mercédès motor, weighs 1600 lbs., can carry a useful load of 1300 lbs. and can climb at the rate of 4500 ft. in 15 min.

#### —Ballistics

[Simplified Ballistics for Anti-Aircraft Guns. By Capt. G. Manetti. *Rivista di Artiglieria e Genio*, Apr, '16. 1800 words. Illustrations. Tables.]

(This is a mathematical discussion consisting largely of equations, drawings and tables. The object is the development of ballistic tables more suitable for use with anti-aircraft artillery than the usual tables based upon fire at targets approximately on a level with the gun. The result is obtained by a change in the axes of co-ordinates, using as one principal axis the tangent to the trajectory at its initial point. Extensive tables are developed for use in expediting calculations.)

#### —Range of

[Aviation Notes. *Army & Navy Jour.*, Apr 29, '16. 250 words.]

Three thousand yards was formerly regarded as extreme height, but some aeroplanes have been brought down from that height by fire, and others have been hit at 10,500 feet. The difficulty of ranging remains considerable and errors of 1500 feet are quite common. Most batteries aim at normal height, 7500 to 8500 feet. During the Champagne and Artois offensive some flying was done at 2400 feet on account of clouds, but low flying is dangerous.

#### ARCHANGEL

[A Great Seaport Near the Arctic Circle. From H. D. Baker's article in *Commerce Reports*. (U. S. Govt. Printing Office.) *Review of Reviews*, Dec, '15. 1200 words.]

Describes the port of Archangel, now one of Russia's two ports open to foreign traffic. Archangel is near the mouth of the Dwina River, stretching along its eastern bank from near its mouth a distance of thirty miles. The Dwina is 20 to 40 feet deep with 3 foot tide, and the depth at the piers is usually 22 feet or more. The Dwina is connected by a system of inland waterways with almost every important town of European Russia. The

railway communications are not satisfactory, but they are being improved as rapidly as possible.

But for the ice, Archangel would be one of the finest ports in the world. The river begins freezing in October but it is expected to keep it open out through the White Sea till December. Two of the largest ice breakers in the world are now there for that purpose.

In August, 120 large steamers were in port, and about 300 had arrived since May. A railway is being rapidly constructed to Kola, in Lapland, to replace Archangel as a winter port. This railway will be completed about January or February, 1916.

#### ARGENTINA

##### —Army

[The Argentine Army. Advantages of Its Permanent Existence. Social Influence That it Exercises Upon the Nationalization of the Race. By Captain Francisco S. Torres. *Revista Militar* (Argentine), June, '16. 3500 words.]

It is axiomatic to-day that the general progress, culture and economic independence of a state are in direct relation to its military strength. Modern militarism favors the development of democratic government. It inspires that confidence in a government which is necessary for the growth of commerce and industry. It also awakens the inventive genius of a nation and encourages initiative in the arts and sciences.

The mercenary armies of olden times could not endure to-day for technical, financial and social reasons. That nation which depends upon voluntary service for defense or which puts its trust in national pride and the patriotism of untrained citizens, is preparing its own downfall.

To maintain an army of volunteers, the state would have to compete with the wage scales of civilians. The ordinary individual would not endure the hardships and privations of military service merely to keep the ranks filled in time of peace however willing he might be to enlist to defend his country in time of danger.

The problem has been to prepare a trained modern army for the defense of our country. Conscription is the solution of the problem. Foreigners, attracted by the generous laws as well as by the great national resources of Argentina have arrived in such numbers that to-day half the population is of alien birth or parentage. The permanent army fulfills the important rôle of nationalizing and democratizing the conscripts, who from all walks of life and from all classes and conditions are brought into intimate contact under its banners.

The conclusion is that conscription is the only national and equitable scheme of national defense, and that it is a leveller of castes and makes for democracy as could no other system.

See also

EDUCATION—MILITARY—ARGENTINA

**ARGENTINA—Continued****—Army—Cavalry***See also***HORSES—BREEDING OF—ARGENTINA****—Army—Infantry***See also***INFANTRY—DRILL      REGULATIONS—ARGENTINA****—Army—Instruction and Training**

[Regional Maneuvers. By J. E. Rodriguez, Col. Commandant of IV Brig. Inf. *Rev. del Circulo Militar*, Oct, '15. 5000 words. 1 map.]

(An account of the Argentina maneuvers, giving the problems set, the way they were worked out, and the criticisms of the director.)

**—Army—Personnel**

[Military Service. General Considerations. by Doctor Alberto Stucchi. *Revista Militar* (Argentine). May, '16. 6200 words.]

A discussion of the new army laws of Argentina. Certain features are pointed out which are considered defective in that they have been transplanted from French and German laws without the modification necessary to adapt them to the peculiar economic, social and political condition of the Argentine people.

The number of illiterates is so much greater in this country than in those others which have attained a higher degree of civilization that the army has the additional rôle of being a great public school for the dissemination of mental, moral, and physical instruction to the thousands of ignorant conscripts who annually fill the ranks.

5730 of the 13,700 men incorporated in the last conscription were illiterate. As the percentage of illiterates is so large, it is the more necessary to utilize to the fullest extent the knowledge possessed by men educated to the various professions and trades, whose higher intelligence would especially fit them for duty in the technical services.

Changes in the law are urged to enable the state properly to take advantage of the educational qualifications of individuals, and to permit elasticity in determining the period of service. It is well known that the less intelligent conscripts require a longer period of instruction to fit them for their duties than do those who have had educational advantages or who can at least read and write. To require the same period of service of all is illogical, besides being a needless expense to the state.

**—Army—Sanitary Service***See***SANITARY SERVICE—INSTRUCTION AND TRAINING—ARGENTINA****—Compulsory Military Service**

[Points of View upon Independence, Immigration and Compulsory Service. By Col. Francisco Medina. *Revista Militar* (Argentina), 9 July, 1916. 3200 words.]

The two transcendental ideas of the social evolution of Argentina were that of independence, and that of immigration. The former implanted the problem of anarchy, against which the struggle lasted for 37 years;

the latter, that of cosmopolitanism, which more than once has very nearly brought disaster to the state.

The danger of cosmopolitanism rests in the fact that the stranger continues to feel that he is an alien and transmits this feeling to his children, in this way weakening the national spirit.

This has been a serious question in Argentina, where the foreign born population is relatively large. Compulsory military service has remedied the evil. It makes true patriots of the children of the foreign born citizens. This is only one of the many advantages it has brought. The army is the institution which has contributed most highly to the progress of the state. It is the school of the people. Independence, immigration and obligatory service enable the Argentine race to offer to the world one of the most beautiful examples of liberty, humanity and democracy.

**—History**

[The 9th of July, 1816. By Doctor Juan Isella. *Revista Militar* (Argentina), 9 July, '16. 1300 words.]

(A patriotic address eulogizing the heroes of the Argentine War of Independence.)

*See also***BELGRANO, GENERAL DON MANUEL**  
**SARMIENTO, DON DOMINGO FAUSTINO****—Military Policy of***See also***ARGENTINA—COMPULSORY MILITARY SERVICE****ARMOR**

[Armor Coming in Again. *Arms & the Man*. Nov 25, '15. 800 words.]

As a natural consequence of the fact that in this war—on the Western front, at least—troops are no longer mobile, the armor of romantic history is again being used. It was a change in strategy that called for long and rapid marches that made necessary the discarding of the old armor, and now that such marches are no longer necessary it can again be used, and is used, to great advantage.

Against high-explosive shells there is no protection, but good armor is proof against shrapnel bullets. The rifle bullet has a very great velocity and, head on, it will go through the bodies of six men; but when it strikes a glancing blow it flies off easily. Here rounded armor such as the steel skull caps now worn by the French soldiers proves very effective.

The weight of armor is not a serious objection, since a very serviceable half armor weighs only about 30 pounds.

[Defensive Armor. *Army and Navy Gazette*, Dec 11, '15. 400 words.]

In the South African war there were signs of the adoption of defensive armor. Representatives of many firms approached officers proceeding to the front, claiming to have patented and manufactured an enlarged breast plate, which was proof against any bullet. It was light, did not interfere with free movement of the wearer and was almost decorative. Few officers purchased this defensive armor



themselves, but anxious friends or relatives supplied many.

In this war of position it has been found that defensive armor of some sort is necessary and for some months past the French infantry has been supplied with steel helmets. Head wounds have consequently been less serious. We, too, rather late, have decided to give our men similar protection and steel caps for our men are in process of manufacture and are being forwarded as rapidly as possible. The question of providing some sort of breast piece has been raised but nothing satisfactory, light, bullet proof, and commodious has been evolved. In a book recently published by the Kaiser's fifth son, reference is made to the manner of attack by a German regiment in Champagne, where men fought in threes, covered by the shields of disabled machine guns, borne by the center fighter.

These are merely extemporized expedients. It seems that defensive armor which shall protect the vitals of our soldiers is necessary, and it is believed our inventors will produce something light and easily carried.

See also

AERONAUTICS—ARMORED AEROPLANES  
AUTOMOBILES—ARMORED  
FORTIFICATIONS — PERMANENT — ARMORED  
TURRETS  
HELMETS—ARMORED  
RAILROADS—ARMORED CARS

—Manufacture of

See

ORDNANCE

**ARMS**

See also

CAVALRY—ARMS  
INFANTRY—ARMS—RIFLE

**ARMY**

See

STAFF

—Administration of

See

ADMINISTRATION, MILITARY

—Organization

[The Army of a Democracy. By Lieut.-Col. Rodolfo Martinez Pita, Army of Argentina, *Revista del Circulo Militar*, Buenos Aires, June-July, '16. 9000 words.]

The countries of young America are, and will be for some time, states of great area and comparatively small population. Moreover, they are potentially very rich. It is readily seen, therefore, that this condition of affairs gives rise to two important factors which tend constantly to oppose the maintaining of political and social entity. These are: first, the comparative isolation of their inhabitants, which naturally produces strong local feeling, stronger, perhaps, than the sentiment felt towards the central government. This spirit, carried to excess, may easily result in social or political anarchy. Second, the attraction and desire which poorly guarded treasure is sure to arouse in other and stronger states.

From these conditions arises the necessity for an army which, on account of the things

it is to guard, should demand and receive whatever may be necessary for its formation and support. In forming this army it is essential, however, that its organization and interior discipline be such as will most readily harmonize with the characteristics of the units of which it is formed.

Let us now consider the different systems of organization from which our nation may select the one best suited to its use.

#### THE VOLUNTARY SYSTEM

In this system the standing army is formed by those who make the bearing of arms their profession, thus freeing the remainder of the population from the tax of blood which the internal disorders or foreign relations of the state might demand. It might be adopted by some nation which for geographical or other reasons considers its borders inviolable, or that their defense could be effected by other means. Such was the case with England. An army of this type would be efficient only in securing interior order and safety. Furthermore, in order that such an army might be an instrument of law and order outside the state, there must enter into its composition certain elements difficult of achievement in a country possessing vast riches and a small population.

Therefore on account of the general conditions which the adoption of this system presupposes, and the one end only to which it readily lends itself, it is, without further discussion, dropped as unable to fill the needs of our own democracy.

#### THE MILITIA WITH COMPULSORY TRAINING

The perfect model of this excellent system is to be found in Switzerland, whose geographical situation, territory, culture and political organization make such a system possible. However, its army is organized only for defense until one of its stronger neighbors can intervene in its behalf, and every republic might not possess such friendly and strong neighbors. Therefore this Swiss system would not prove universally satisfactory.

#### UNIVERSAL MILITARY TRAINING

This system, now adopted almost everywhere, requires that each male citizen at some time of his life shall form a part of the regular establishment, and that during a certain period he shall give his personal services to the government. This system exists to-day in Argentina and it has many advantages. It cannot be denied that conscription has already helped form a truer and finer spirit of democracy. It has been of inestimable service in the great fight against illiteracy and at the same time has served to spread the good habits of order, discipline, hard work and hygiene. To many the first awakening of real patriotism has come in our barracks in the shade of a flag whose very colors were, until then, unknown. In their passage through the ranks of the army many citizens have felt for the first time the stimulating effect of true equality and fraternity, and have reached a higher and better understanding of their rights and duties as citizens.

**ARMY—Continued**

However, it may be that personal and obligatory military service applied in a restricted sense (as in the case in Argentina) will suffer from an anti-democratic spirit, and this in spite of the fact that chance is allowed to name those who shall serve. Military service is similar to any other national tax; it even goes further. It is the highest form of indebtedness, a blood tax, and for that very reason has a greater value. Since absolute equality is the keystone of any true democracy, it follows that any tax not borne equally by all the citizens, is not a democratic tax. The Constitution of the Republic of Argentina provides that equality shall be the basis of all taxation; and in order to harmonize that spirit of equality with military service, such service must be shorn of its restrictive qualities and must become universal in fact as well as in name.

It is frequently urged that universal military service is conducive to militarism, but such is not the case. Of course, the results achieved by this training, if placed unreservedly in the treacherous hands of a privileged class or an unscrupulous and despotic social caste, might easily become a powerful instrument of oppression and conquest, but in any free and well governed democracy such a condition of affairs can never exist.

See also

ARGENTINA—ARMY

CHILE—ARMY—ORGANIZATION

INDIA—ARMY—ORGANIZATION

NON-COMMISSIONED OFFICERS—SELECTION OF

—Organization—Officers

See also

OFFICERS—INSTRUCTION AND TRAINING

—Organization—Swiss-Australian System

[A Test of the Swiss Military System. By Maj. Charles Miller, 7th Infantry. *Infantry Jour.*, Jan, '16. 3000 words.]

*The Mutiny at the Flüela*

A corps commander of the Swiss Army records in the *Neue Zürcher Zeitung* the following incident:

During maneuvers the weather changed into a heavy rain and snow. The signal for breaking off a combat exercise was greeted with loud manifestations of joy, but even louder ones of displeasure were heard when these élite soldiers realized that they, as well as the assembled officers, were to be held in the bad weather to the end of the critique. Their now clearly expressed desire receiving no notice, these men simply started the return march without their leaders! When they found that their superiors did not oppose them, the angry swarms cooled off and allowed themselves to be formed into military columns, and all again assumed that outward military appearance which so many of my countrymen consider a sufficient indication of our country's ability to oppose successfully a great power.

If nothing more serious than disagreeable weather justifies renunciation of military obedience and running away, can one imagine how

such heroes would run if, instead of being exposed to rain and snow, they found themselves exposed to a shower of bullets?

This revolt was soon over, and it was, of course, nothing but the natural ingenuous conduct of an entirely untrained body of troops. But the incident conveys its lessons. Such a command is entirely unreliable, and it is useless for war.

Military training alone will create that reliability which never fails in any situation. As for the officer, his usefulness depends not upon knowledge, not upon efficiency, but primarily upon the deep consciousness of being an officer. The officers at the Flüela should have acted promptly and energetically. The occurrence should be sufficiently humiliating to produce a general realization of a bad state of affairs, and it will become a blessing in disguise if it leads to an improvement in our system.

(These remarks are from Colonel Wille, the corps commander.)

The condemnation of the lack and insufficiency of training of officers and men is severe and unqualified.

The Swiss system is often mentioned as a model upon which to build. It would appear that the system possesses the very serious defect (to quote Col. Wille) of "lack and insufficiency of training." The material of the Swiss army is excellent. The contention that only intensive training and instruction for a definite period can make efficient modern soldiers seems to be proven. Even now, when men are urgently needed at the front, the experience of European nations fixes the minimum period of such instruction at ten months.

See also

COLOMBIA, UNITED STATES OF—ARMY—REORGANIZATION

SWITZERLAND—ARMY—ORGANIZATION

UNITED STATES—ARMY—ORGANIZATION

—Pay

See

PAY, ARMY

—Relation to the State

[The State and the Army. Lecture by General Sarasti. *Revista Militar* (Ecuador), May, '16. 6000 words.]

(An academic discourse, treating of the duties and rights of a nation, of armies as elements of a sovereign state, and of diplomacy and war.)

—Use of for Civil Duties

[Soldier Help for Farmers, by A. T. T. *The Canadian Military Gazette*, Feb 8, '16 700 words.]

Strict economy and increased production must be the rule in Canada unless the Government expects to have difficulty in meeting the pension claims and paying the interest on the war debt. Large production can result only when the farms are properly worked. This year throughout the whole of Canada there is a great deal of spring work to be done on the farms, which work can not be done by the labor left on the farms.

Last year soldiers were used to harvest the

crop, and it is now proposed to have them help the farmers with their sowing and farm work in general this spring. It is claimed that for "hardening up" the soldiers this work will do quite as well as the usual physical drills and route marches.

#### ARTILLERY

[Artillery Matériel and Employment of Artillery. By Don Carlos Barntell y Power, *rial de Ingenieros*, Madrid, Jan, '16. 18,000 words.]

Captain of Engineers, Spanish Army. *Memo-* (This article is a detailed discussion of heavy and light field artillery including siege artillery; the recent developments in matériel and in the tactical use of the several classes, as well as the classification and defence of fortified places. The character of the article is such that it does not lend itself readily to condensation.—Ed.)

See also

AERIAL ARTILLERY  
ANTI-AIRCRAFT ARTILLERY  
COAST ARTILLERY  
FIELD ARTILLERY  
MACHINE GUNS  
MOUNTAIN ARTILLERY  
NAVAL ARTILLERY  
SHELL SHOCK  
SIEGE ARTILLERY  
SUPPLY AND TRANSPORT—INTERRUPTION OF  
BY ARTILLERY FIRE

—Ammunition—Consumption of

See also

EUROPEAN WAR—AMMUNITION—CONSUMPTION OF

—Erosion

[Tchernov's Theory of the Origin and Spread of Erosion in the Chamber and Bore of Cannon. By H. Peloux, Capt of Artillery. (Translation from the French) *Svensk Kustartilleritidskrift*, Vol. II, Part I, '16. 1700 words and 11 diagrams.]

—Fire

See also

BALLISTICS

—Fire—Attack Under—By Infantry

See

INFANTRY—ATTACK—UNDER ARTILLERY FIRE

—Fire—Audibility of

[The Distance at Which Heavy Gun-firing Has Been Heard. *Scientific American*, Jan 8, '16. 150 words.]

Mr. M. Christy in *Nature* reports results of observations, showing that the heavy gun fire at Ypres has been heard a maximum distance of 140 miles.

[The Audibility of Gun Fire. By W. Krebs, German Weather Bureau. *Artill. Monatshefte*, Sept-Oct, '15. 3200 words.]

In the present war, many unusual circumstances have been observed concerning the distance at which the noise of gun fire can be heard. Similar experiences are recorded in the history of past wars. At the battle of Liegnitz, Aug 15, 1760, General Daun and Lacy

both failed to go to Laudon's aid because neither one was aware that the latter was heavily engaged, not being able to hear the sound of his guns. History states that the wind was unfavorable. During the Civil War (U. S.), Gen. R. G. H. Kean observed the same circumstance at the battle of Gaines' Mill in the Chickahominy Valley. Although he plainly saw over 50,000 men and 100 guns engaged in battle for more than two hours, he reports that not a sound of the firing was heard, though the flash of the guns could be seen. The weather was clear. Tauchnitz reports a similar personal experience during the siege of Paris, Jan 5 and 6, 1870. At certain places no sound could be heard of the bombardment which was going on. At times the noise of gun fire would subside and then later burst forth with a loud crash. The weather was foggy. At the battle of Spicheren, Gen. v. Steinmetz censured one of his division commanders for not having marched to the sound of the guns. The latter claimed not to have heard any cannonading, although only a mile or so distant from the French position which he might have attacked in rear. There was an intervening wood.

On other occasions, the sound of gun fire has been heard at great distances. The recent bombardment of Antwerp, Oct 7-9, 1914, was heard at points in Friesland and Westphalia, over 200 km. distant. The same phenomenon was observed in 1832 at the bombardment of Antwerp. The firing of the English at German Zeppelins flying over Yarmouth on Jan 19, 1915, was heard at points as far distant as Rotterdam, 200 km. away. The gun fire of the naval battle off Heligoland, Jan 24, 1915, was heard in Friesland, 150 km. distant. The bombardment of Libau on May 8, 1915, was heard at Wisby in Gotland, 205 km. distant. The gun fire during the battles in upper Alsace was heard from Stuttgart to Bregenz, more than 180 km. distant. In the first and the last of these cases, no noise of gun fire could be heard at a relatively short distance from the scene of action. There existed, in other words, so-called "zones of silence." This phenomenon will be explained scientifically as more data become available

[The Audibility of Gun Fire (continued). By W. Krebs, German Weather Bureau. *Artill. Monatshefte*, Nov, '15. 2000 words.]

(Note. Continued from *Artill. Monatshefte*, Sept-Oct, '15. See p. 107. *Int. Mil. Digest*, Mar '16. The November, 1915, issue of the *Artilleristische Monatshefte* has never been received. Digest will be given later if a copy can be secured.—Ed.)

[The Audibility of Gun Fire. Parts III and IV. By W. Krebs, German Weather Bureau, *Artill. Monatshefte*, Jan-Mar, '16. 11,000 words. illus.]

(Note: Continued from *Artill. Monatshefte*, Sept-Oct, '15 (see *Int. Mil. Dig.*, Mar '16, p. 107) and Nov, '15. The Nov, '15 issue of the *Artill. Monatshefte* has never been received.)

**ARTILLERY—Continued**

The official German correspondent on the Western Front gives an account of his approach to the battle field in Northern France during the great offensive launched by the Allies in September, 1915. From Sept 21 to 25, the heavy cannonading of both sides could be heard distinctly at distances as great as 50 km. from the battle front. On the morning of Sept 26 no sounds were audible, although he was approaching Champagne, where the French at that moment were launching their great offensive. He arrived at the battle field on the evening of Sept 26, could plainly see the flashes of the guns and of the projectiles as they burst, but not a sound of the explosions was audible, even at relatively short distances.

An examination of the weather records for these days explains the causes of these phenomena. From Sept 21 to 25, the weather in northern Europe was dry and clear, a high area extending from the North Sea to the southeast of Europe. The prevailing air currents were from the northeast, with a far greater velocity in the upper air strata. The night temperatures were the lowest for the month. This indicates a rapid increase in temperature as we go up to the upper levels. Now, experiments carried out by different scientists show that under the above temperature conditions, the sound waves from the point of origin take a direction concave to the earth's surface. This promotes the propagation of the sound waves in the upper strata which is further increased if the wind is in the same direction. When these two conditions exist in conjunction, they increase the distances at which sounds will be heard. Such were the conditions existing prior to Sept 25. On this day and especially on Sept 26, an atmospheric change took place. On Sept 25 a low area was advancing from the ocean in a north-easterly direction. This low area passed over the Champagne district on the evening of Sept 26. If the temperature of the air in the upper strata is less than that of the strata beneath, or if the velocity of the upper air currents in the direction of the observer, is less than that of the lower air currents, then the sound waves from the point of origin will take a direction convex to the earth's surface. This will produce a sound shadow or zone of silence at some distance from the origin of sound, in which zone no sound will be audible. Yet if the hearer could elevate his position he would again come within the zone of audibility. Such was the condition on Sept 26. When the two conditions exist in conjunction, especially when the air currents are in a direction from the observer to the source of sound, the convexity of the direction of the sound waves is increased and the sound will be inaudible at a relatively short distance from the origin. Such were the conditions on the night of Sept 26, when the wind was from the southwest.

The first discoverer of these zones of silence was Stokes, in 1857. According to Tyndall, Stokes showed that this phenomenon

is due to refraction, caused by a variation of velocity of the air from the earth's surface upward. This produces an inclination in the wave front, making the sound travel downward if its direction is with the wind and upward if against the wind. Osborne Reynolds first pointed out that refraction would also result from a variation in temperature of the air at different heights. His experiments were continued by Tyndall. These experiments were practically investigated and applied by the Norwegian scientist Mohn, in determining the audibility of sirens of the light-house service. Mohn by experiment determined the following equation:

$$Xz = \frac{\sqrt{h} + \sqrt{z}}{\sqrt{k}}$$

in which  $Xz$  is the limit of audibility which it is desired to determine,  $z$  is the height above sea level of the listener's ear,  $h$  is the height above sea level of the origin of sound,  $k$  is an expression obtained from considering the temperature, the humidity, the velocity and the direction of the wind. It is determined by the equation:

$$k = 0.0009175 \Delta t + 0.0001243 \Delta e - 0.001506 \Delta w \times \cos p$$

in which  $p$  is the angular difference between the direction of the sound and the wind; and

$$\Delta t = \frac{t_0 - t_y}{y} \text{ for temperature,}$$

$$\Delta e = \frac{e_0 - e_y}{y} \text{ for humidity,}$$

$$\Delta w = \frac{w_y - w_0}{y} \text{ for velocity of wind.}$$

These experiments by Mohn also assist us in solving the audibility problems presented in the accounts of Sep 19, 1915, and Jan 5 and 6, 1871, described in the *Artill. Monatshefte*, Nov, '15.

With the insufficient data now at hand, it is impossible to explain the audibility phenomena previously described which occurred at Spicheren and Rossel, Aug 6, 1870. It is possible to give a solution, but this is not fully substantiated by the available conflicting data. It is a remarkable coincidence that a similar failure to hear the gun fire of neighboring troops also took place on the French side.

A correspondent at Oberstein on the Nahe, 150 km. from Verdun, reports the following observations concerning the audibility of gun fire from Verdun, extending over a period of a year. "As winter approached the sounds of gun fire became more distinct. In Nov and Dec each separate explosion could be heard. Strange to say the sounds were intensified when the ear was placed close to the stove. Toward the middle of April, the sounds of gun fire became less distinct. Later, as the weather grew warmer and the trees began to blossom, no sounds could be heard any more, except for one day, the 16th of May. . . ."

The intensified sound near the stove was due to the resonance of the chimney. This is a phenomenon frequently observed when Zepelins are in transit. The most interesting is the observation on May 16. On this day there was a sudden cold wave, resulting from a low area which advanced in regular stages from the Canadian-American continent. The conditions at Oberstein on May 15, 1915, were exactly the same as those at Spicheren on Aug 6, 1870. There is only one difference; at Spicheren the distance was not very great, whereas at Oberstein it was 150 km. In both cases we note an increase in audibility after prolonged silence. At Spicheren it was due to direct, at Oberstein, to indirect audibility. This subject will be discussed in the next installment. It may be interesting to note here that all the phenomena of sound reflection and sound echoes, which Tyndall ascribed to invisible but nevertheless existing so-called acoustic clouds of vapor or gases, may be easily explained by temperature and wind refractions and the experiments made by Mohn.

#### —Fire—High Angle

[Notes on High Angle Fire. By H. C. Clausen. *Jour. Royal Artillery*, July, '16. 2500 words. Illustrations.]

(Note.—A technical discussion of a new method to calculate range tables for high angle fire, based upon Obermayer's principle. The equations upon which the principles are based are deduced and their application is then shown in concrete examples.)

The usual method of calculating high angle range tables by taking the trajectory in steps or arcs is a very slow and tedious process, the results not agreeing when the angle of sight is horizontal—that is, on the ground. For this reason in the parabolic method, as when firing in vacuo is used, the formulae, altho they do not account for the varying density of the air, nevertheless give results of more practical value.

Formulae are then deduced, connecting the time of flight, remaining velocity and angle of impact for various angles of sight with the results of the tangent elevation (parabolic) formula.

The equations deduced are:

$$\tan a' = \frac{1 \pm \sqrt{1 - (\sin 2a_0 \cos \epsilon + 2 \tan \epsilon) \sin 2a_0 \cos \epsilon}}{\sin 2a_0 \cos \epsilon + 2 \tan \epsilon}$$

$$T_1 = T_0 \frac{\cos \epsilon \cos a_0}{\cos (\epsilon + a')}$$

$$\frac{V_1}{V_0} = \sqrt{1 - 2 \cos \epsilon \tan (\epsilon + a') \sin 2a_0 + \left( \frac{\sin 2a_0 \cos \epsilon}{\cos (\epsilon + a')} \right)^2}$$

$$\tan \theta = \tan (\epsilon + a') - \frac{\sin 2a_0 \cos \epsilon}{\cos^2 (\epsilon + a')}$$

in which  $\epsilon$  = angle of sight;  $a'$  = tangent elevation of gun necessary to give the range at the particular angle of sight =  $E$ ;  $a_0$  = tangent elevation on the ground, that is, when angle of sight is zero;  $T_1$  and  $T_0$  are times corresponding to angles of sight =  $E$  and zero, respectively;  $V_1$  and  $V_0$  are remaining veloci-

ties corresponding to angle of sight =  $E$  and zero, respectively;  $\theta$  = angle of impact made with the horizontal.

The maximum heights and corresponding times are then calculated in two parts, first part from the initial velocity to a velocity of 1000 f/s; second part from this latter velocity to zero velocity.

The formulae used for this purpose are deduced from the law of resistance of the air:

$$\rho = \frac{\kappa}{g} \left( \frac{V}{1000} \right)^2$$

The formulae are:

Part I,

$$t_1 = \frac{1000}{\sqrt{g \delta_1}} \left\{ \tan^{-1} \frac{v_1}{100} \sqrt{\frac{\delta_1}{g}} - \tan^{-1} \sqrt{\frac{\delta_1}{g}} \right\}$$

Part II,

$$t_2 = \frac{1000}{\sqrt{g \delta_2}} \tan^{-1} \sqrt{\frac{\delta_2}{g}}$$

$$\text{Part I, } y_1 = \frac{1000^2}{2 \delta_1} \log \left\{ \frac{1 + \frac{\delta_1}{g} \left( \frac{v_1}{1000} \right)^2}{1 + \frac{\delta_1}{g}} \right\}$$

$$\text{Part II, } y_2 = \frac{1000^2}{2 \delta_2} \log \left( 1 + \frac{\delta_2}{g} \right)$$

in which  $t_1$  and  $t_2$  represent the times;  $y_1$  and

$y_2$  the heights;  $\delta = \frac{d^2 k}{w}$ ,  $w$  = weight of the projectile,  $k$  = a constant obtained from air resistance equation,  $d$  = caliber of the gun.

It will be seen from plotted curves that all modern rifles and guns when fired vertically will reach the maximum height attained by aircraft under service conditions. The time of flight should, however, be as short as possible; hence the need of high velocity guns.

[The Audibility of Gun Fire. By Charles Nordmann. *Revue des Deux Mondes*, Sept 1, '16. 6000 words.]

(After some generalities based on the idea that the present war in Europe is more audible than visible, and an elementary explanation of sound waves, the author takes up the subject of the distances at which guns have been heard.)

From investigations recently made by M. Bigourdan and communicated to the Academy of Sciences, it appears that the sound of some recent cannonades has been very clearly heard at 250 km. There is nothing astonishing in this: in 1792, the sound of guns fired at Mayence carried about 245 km.; later, in 1809, gun-fire at Heligoland was heard at 200 km. From the outbreak of the present war guns have been heard at very great distances. The subject has been investigated by Doctor Van Everdingen, of the University of Utrecht, who reports that the guns at Antwerp in October, 1914, were heard at Groningen, 270 km. off. From observations of the 28th of October, 1914, collated by the same specialist, of the

**ARTILLERY—Continued**

bombardment of the Flemish coast by heavy English guns, it seems to be established beyond doubt that this bombardment was heard at a distance of 290 km. We naturally should expect the distances at which modern gun-fire is audible to be much greater than was the case in former times; the Mayence guns of 1792, however, were heard at distances comparable to those of more recent instances. But if the law that the mechanical effect of a mine varies directly with the square root of the charge hold in respect of the propagation of sound regarded as a mechanical effect, we can not expect any great increase in the distances at which modern gun-fire may be heard.

Meteorological conditions, as is well-known, affect the propagation of sound; moreover, travel is faster in certain media than in others, for example in hydrogen, in which it is four times as rapid as in air. These conditions may explain, perhaps, the phenomenon of the so-called *zones of silence*. Although observed before, nevertheless the cannonades of the present war have furnished new and interesting data. This subject also has been investigated by Doctor Van Everdingen, especially with reference to the bombardment of Antwerp by the Germans. He established the existence of a zone of silence, between 100 km. and 150 km. around Antwerp, beyond which the gun-fire again could be heard. Beyond 160 km. the intensity of the sound was perceptibly increased.

This phenomenon has more than mere scientific interest; it has, so to say, influenced military operations, and examples are given by Captain Moch, of the French Artillery, in his essay on "Smokeless Powder and Tactics." A notable illustration is that of Castagny's division, which, at Forbach, marching to the sound of the guns, ceased to hear the sounds after a time, and so, thinking the action over, returned to its point of departure, only to pick up the sound again, but this time too late.

It is possible that the wind may be the cause of these silence zones. A head wind for example would seem to drive the sound waves upward, because the velocity of the wind increases as one rises from the earth. But this increase has a limit; and if, as appears reasonable, it ceases at a certain altitude, then the effect is, farther on, to deflect the sound waves toward the surface of the earth. Moreover, the wind may change direction, a phenomenon of frequent occurrence. Changes of temperature will produce the same effect, so that a six o'clock wind on the surface of the ground may have a twelve o'clock wind blowing over it. In the variable character of the meteorological factors of the question must be found the explanation of the variation in form and extent of the observed zones of silence. Thus, although in general firing is better heard when its sound comes down the wind, yet in other cases the opposite has been observed, as at Verdun, for example. In certain regions of Burgundy, the guns at Verdun are much more clearly heard in a

southwest wind, than in a north or northeast. It is not unlikely that between these regions and the front there lies a zone of silence formed by a head wind; the feebleness of the sounds brought down by the north wind may be due to the fact that the waves have been deflected by this wind toward the earth before reaching these regions.

But many more observations must be made, checked by experiment, before definite conclusions can be formed. In the mean time, theories multiply; according to one of them, the perception of the sound of the guns beyond the zone of silence is due merely to geologic formation. The stratum or layer on which the batteries are emplaced, dips down, thus forming a zone of silence, and cropping out beyond, carries the sound with it. The composition of the atmosphere must also be taken into account. It is certain that its upper layers are richer in light gases, especially hydrogen, than the lower. Hence, since the velocity of sound is greater in hydrogen than in air, it must increase sufficiently at high altitudes to be curved down to the surface of the ground, as required by theory.

**—Fire—Long Range**

[The Extreme Ranges of Modern Guns. By Alston Hamilton, Major C. A. C. *Scientific American*, Apr 8, '16. 3000 words. Illustration. Diagram. Tables.]

(An article in popular style, describing the influence of the shape of the head of the projectile on the air resistance, and discussing trajectories with 4000 f. s. initial velocity and no resistance. This subject pursued to 5000 f. s. initial velocity gives a theoretical range of 147 miles and a maximum ordinate of 37 miles. Trajectories in air are of course quite different, but even so, the resistance is considerably affected by the diminution of pressure at even moderate altitudes. A 16-inch gun with initial velocity of 2600 f. s. would give a range of 27 miles, and with i. v. 4000 f. s., a range of 85 miles. A range of 21 miles, that reported in the bombardment of Dunkirk, would be possible with a 10-inch gun, initial velocity 2450 f. s., and with a 16-inch gun with initial velocity of 2250 f. s.)

**—Instruction and Training**

*See also*

MUSEUMS, MILITARY—OF ARTILLERY

SIGNALLING—INSTRUCTION AND TRAINING

**—Long Range**

[Two Indispensable Aids in the Direction of Artillery Fire. By Maj. G. af Wetterstedt. *Svensk Artilleri-Tidskrift*, parts 3 and 4, '16. 4300 words and 2 tables.]

The direction of fire of the artillery now offers more difficulties than the artillerists of the last century ever dreamed of, owing to the greatly increased ranges and the necessity for complete concealment of the batteries.

The proposed aids in fire direction pertain principally to the heavy artillery during its operations in position warfare, but can also be employed with advantage in more mobile actions and by all kinds of artillery.

1. Preliminary trial firing, to ascertain the

range and direction of the objectives that are to be fired on later. This may be for a single battery, but oftener for larger artillery groups in preparation for a combined *curtain* or *drum fire* to prepare for an assault on the enemy's position, or to defend against his attacks. It may be also to prepare for the bombardment of certain of the enemy's batteries whose position has been ascertained. This trial firing often requires considerable time, and it should, if possible, be so conducted as not to give the enemy an idea of its object.

2. A complete record should be made of the position of the objects fired at, the elements of fire, atmospheric conditions and the result of fire, for the use not only of the batteries that are to take part in the projected fire, but also for future use. This is especially necessary in position warfare. Forms for this book-keeping record are given in the two tables appended.

#### —Manufacture of

See

NOBLE, SIR ANDREW  
ORDNANCE

#### Great Britain

[The manufacture of English 12-Inch Guns. By Carl F. Jaensen, Ordnance Engineer, Washington Navy Yard. *Scientific American*. Dec 4, '15. 900 words. Illustrated.]

(A brief non-technical description of the construction of guns, with few details.)

#### —Measurement of

[The Caliber-Measure of Artillery. By Lt. Allan Cyrus. *Svensk Kustartilleritidskrift*. Part 2, 1916. 1900 words.]

For many years after the artillery had passed its childhood, there was no generally accepted system by which the pieces were classified and named. Well along in the 15th century there was such a variation in size and types of the guns that the name of a cannon of this period gives no idea of the size or weight of the projectile for it. Thus the weight of a projectile for a French "*double cannon*" in 1539 is given as 38 lbs., but it is also stated that other such cannon are firing projectiles up to 80 lbs. in weight. Also while one "*coulverine moyenne*" weighed 1200 lbs., another weighed 2500 lbs., etc.

Charles V tried to remedy this, in the new guns that he had manufactured, by reducing the number of different cannon to seven and fixing their dimensions.

By means of the *Nürnberg measuring stick*, invented in 1540 by Mechanician G. Hartman, a great step forward was made to attain uniformity. This measuring stick is described as consisting of a four-sided rod having a length of one Nürnberg foot, on one side divided into 12 inches and each inch into 4 "minutes"; on the second side was a scale of weights for the corresponding lead bullets; on the third side for stone balls, and on the fourth for iron balls.

This measuring stick is described as being also in the form of a metal plate with five lines (or columns) on it, called the *iron, stone and lead ball, the caliber and stone line*.

The first three referred to *balls* of iron, stone and lead; by the caliber line, the sizes and weights of the balls used in the cannon were obtained; and by the stone line, the calibers and weights for mortars and howitzers, since stone balls were fired in the latter.

On each of the five lines were set off from one end 5 Nürnberg decimal inches, at which point on the first line was written 24, on the second 8, on the third 37, on the fourth 21 and on the fifth 7; which with respect to the first three meant that a ball of iron, stone or lead of 5 in. diameter weighed, respectively, 248 and 37 lbs., all Nürnberg weight.

In manufacturing projectiles for these guns a certain amount of "windage" was allowed, which increased with the increase in the size of the ball; so that the iron ball for the 5 in. gun was of 4.78 inches diameter and weighed 21 lbs. and the stone ball with a diameter of 4.767 inches weighed 7 lbs. These five lines were then filled in with the corresponding sizes and weights so that one could determine at a glance the diameter of the bore and the caliber and weight of the projectile for any piece of artillery.

This worked very well as long as stone projectiles were used in howitzers and mortars, but soon these were displaced by hollow shells and bombs of iron. These, of course, varied in weight from the stone projectiles and from each other.

The Nürnberg measuring stick was also introduced into most other countries with the original method of notation retained, but since the different countries inserted their own measures and weights, the result was that the weight of the balls did not correspond to the pound designation of the guns, and the original good system went askew and lost its meaning.

In Sweden Quartermaster Samuel Oru constructed, about 1685, an artillery measuring stick in which the Swedish quarter of an "*alu*" (an *alu* equals two feet), which is somewhat longer than the Nürnberg, was taken as unity, with the same designation for weights as the latter. From this resulted the inconvenience that a projectile did not weigh what the measuring stick indicated. For example, a ball that from the iron line should weigh 24 lbs. weighed in reality about 29 lbs. in *provision*, or *heavy* weight; which was equal to 35 lbs. of *iron*, or *light*, weight (since matters were also complicated by having two kinds of weights). The cannon were weighed by *iron* weight and the cannon balls were named after their *provision* weights.

The "windage," according to the older Swedish measuring stick, became for the larger calibers much larger than was necessary or suitable, but this was remedied in 1705 by inserting a new *iron* line and a new *shell* line.

The artillery measuring stick brought with it other inconveniences, besides those mentioned, since all measurements not only of all the parts of the piece but of the gun carriage, vehicles, etc., were given by a scale in which the caliber of the piece was unity, di-

**ARTILLERY—Continued**

vided for guns into 24 parts and for howitzers and mortars into 48 parts, and any variation or inaccuracy in the calculations made an appreciable variation in the size of the parts, so that parts from different factories were not interchangeable.

In Sweden the artillery measuring stick was abolished in 1831 and new tables of weights and measures substituted for it. It was, however, retained in some other countries much later than that.

On the introduction of rifled guns and long projectiles in 1863, the designation not only of the diameter but also of the weight of the projectile was made, in naming the piece, for example the 8 pdr. cannon was designated 2.58/8 pdr.

Later, on the introduction of the decimal system of weights, guns of less than 7 centimeters caliber were designated in mm. and those equal to or greater than 7 cm. in c.m.

For the navy and coast artillery it has lately become customary to add the length of bore in calibers. For example, the 35.5 cm. K.L.-50.

**—Tactics—Co-operation with Infantry**

[Notes on Artillery Tactics in the Attack of Trenches. By Lt. G. N. Tricoche, late French Artillery. *Field Artillery Jour.*, Apr-June, '16. 2000 words.]

Some infantry officers have opposed the theory of the artillery preparation on the ground that it "advertised" the coming attack. They conceded that the artillery must cover the withdrawal in case the attack failed. This contention of the infantry men has been proven incorrect, because the infantry will find itself unable to get thru the wire entanglements unless the latter have been destroyed by well-aimed artillery fire. For this purpose nothing is better than the 75 mm. high-explosive shell, which here as everywhere else has shown its superiority over the shrapnel. The French procedure in using high-explosive shell has been about as follows: a violent bombardment, followed by a lull, causes the Germans to fill the first line trenches to meet the expected infantry attack. But instead of delivering the attack, the French artillery opens up with high-explosive shell upon the trenches and the hostile infantry massed therein. This clever ruse, however, does not fool the Germans any more.

The 75 mm. shell is powerless against dug-outs or bomb proofs, for the destruction of which heavy mortars and howitzers are necessary. However, due to the relative inaccuracy of curved fire, complete destruction of the bomb proofs is not always possible. For this reason an aerial torpedo is suggested, which reports indicate is very destructive.

It is asserted that the 75 mm. gun frequently fails in its mission, and that it is far from being as effective as many people think it is, especially against obstacles and machine guns. The reasons are the following: (1) battery commanders are too stingy with ammunition; (2) too much reluctance to open fire on ob-

jectives which are not sufficiently definite; (3) necessity of dividing attention among too many targets; (4) imperfect adjustment even at short ranges.

As the infantry advances it needs the most intimate support of its artillery. This is not always the case, due to lack of proper communications. It is therefore suggested that lighter guns, such as the pom-pom, manned by infantry, be organized to accompany the infantry line. The use of mountain guns pushed well forward to attack hostile machine guns would help much to unmask and to destroy these dangerous weapons. These suggestions are not concurred in by the French artillerymen. The infantry are rather skeptical of the so-called barrier fire. The principle is admittedly correct, but it often fails in its practical application.

See also

**ATTACK—FRONTAL**

(Article: "How May the German Front be Pierced?")

**INFANTRY—TACTICS—CO-OPERATION WITH ARTILLERY****—Use of in European War**

[Artillery Dominance. A Problem of the Western Front. *Sphere*, July 8, '16. 1000 words. Diagram. Illustrated.]

Previous discussions have covered the operations of infantry against trenches, and have touched upon the subject of bringing forward light guns. The main artillery problem must be considered. Powerful assaults of infantry sweep away the first and second lines of trench, but are brought to a stop by artillery. The real problem is to destroy the enemy artillery.

In a system of defenses, there is a first line of defenses comprising barbed wire, trenches, field redoubts, machine-gun positions, and light field artillery. This system may be a mile or more deep. Behind it is a second line that can be organized before the first line can be broken.

Behind all this lies the heavy artillery. These guns are so well concealed that aerial reconnaissance, now driven far up in the air by anti-aircraft artillery, cannot discover the gun positions.

It has not been possible for either side to find a way to destroy this artillery, and until some way can be found, infantry attacks will break down or suffer murderous losses. At Verdun, the Germans have tried to follow up the infantry assaults by concentrations of heavy artillery.

The desired result cannot be accomplished by random fire over areas in rear of the lines, on account of the prohibitive expenditure of ammunition. Losses are suffered, but swift annihilation of whole batteries has been impossible. Light field batteries can be pushed forward, but until a way can be found to destroy the enemy heavy artillery, no great results can be achieved. Predominance of artillery and infantry will be in the end give the power to overwhelm the final human resistance, and sound strategy in handling these forces will ultimately achieve success.



[The Work of the Italians in the Present War. By A. A. Hannibal. *Voenny Sbornik*, May, '16. 1600 words.]

Of paramount importance is the work of the artillery. The fire of the artillery batteries is frequently controlled by battery commanders from a distance of 3-4 kilometers. Telephones are used for fire control purposes.

The hardest work of the Italian artillery has been to locate the enemy's batteries, and after locating them to move their own batteries up sufficiently to bring them within range of the Austrian batteries, which as a rule are well back of their lines. The lack of cover is the great hindrance to moving the artillery forward.

In order to put a single hostile battery out of action, there is required in modern times a searching fire covering from 20,000 to 30,000 square meters, and requiring from 8000 to 10,000 shells.

In order to determine the location of enemy batteries, numerous infantry patrols are sent forward simultaneously; even if some are driven back others occasionally succeed in bringing in information of value. In attacking it is absolutely essential that every possible preparation be taken to ensure the success of the attack. The artillery must cover the entire position of the enemy with a hail of shells, which must be extended to cover the enemy's rear to prevent the bringing up of reinforcements, interfere with the enemy's artillery, etc. Bombing parties must be detailed in advance to protect the flanks of the command especially after the enemy's trenches have been reached.

See also

#### ATTACK—FRONTAL

(Article: "How May the German Front be Pierced?")

### ASPHYXIATING GASES

[Asphyxiating Gases and Incendiary Projectiles. By S. F. S. *Mem. de Ingenieros*, Mar, '16. 3700 words. Illustrated.]

The asphyxiating gases used during the present European War are the result of experiments made by German and French chemists previous to the war, to produce gases which could be used as a disinfectant and to kill harmful animals.

The gases may be divided into three classes: 1°, The suffocating gases, as carbonic acid and nitrogen; 2°, The poisonous gases which have a quick, fatal effect and which are even fatal in an atmosphere that contains them in the ratio of 1 to 100, as carbon monoxide, cyanogen; 3°, Gases which cause spasms and irritation of the throat, as chlorine, sulphuric acid, some oxides of nitrogen and phosgene.

The principal gases used by the Germans are chlorine and bromine. The former is produced by the electrical treatment of sea-water, the latter is a by-product of the salts of Stassfurt. Both gases are manufactured in large quantities in Germany. Pipes which extend 3 or 4 meters are installed in the trenches and are connected to gasometers. Valves regulate

the flow of the gas. Advantage is taken of the wind to blow the gas in the direction of the enemy. The gases used by the Allies are quite similar.

The French also employ grenades which are thrown by hand or by gun, and explode by percussion or time fuse, scattering suffocating gases.

The liquid flame used by the Germans is a burning oil. The oil is forced through a horizontal tube by compressed nitrogen, and ignites at the mouth of the tube. The flame extends about 2 meters, and dense black clouds of smoke are produced which extend 25 to 30 meters. The instrument is portable and operated by two men.

The French use a vitriolic grenade which consists of a lead case containing sulphuric acid or caustic soda. It explodes by percussion, scattering the enclosed liquid.

[Asphyxiating Gases. From data submitted by Persons at the Front and by Lt.-Cols. Vicens and de la Riva. *La Guerra y su Preparación*, May, '16. 1000 words. Illustrations.]

The method of discharging asphyxiating gases depends upon the distance. If this be short, cylinders are employed similar to those used in the inflation of balloons. For greater distances, projectiles, particularly those of the heavy field artillery, must be employed. The projectiles of this class employed by the Germans are of two distinct types, marked with the letters "T" and "K," because they are used under different circumstances. The ogives of both are painted black to distinguish them from other projectiles, and carry the letters just mentioned.

The "T" projectiles disengage gases of great density susceptible of hanging for a long time over the zone in which they are produced. Hence, they are employed preferably in curtain fire. The "K" projectiles are lighter and are used to batter points to be assaulted and crossed. In general the use of asphyxiating gases is now completely regulated in the German Army. The officer of the battery which is to fire them is responsible for their use. Rain, cold, and head-winds absolutely prevent their employment. Against woods they always give good results. As preventive measures, certain masks are carried to be put on when necessary.

The English at Ypres were surprised by the German gas, but lost no time in devising ways and means to neutralize it. By June, 1915, the troops were provided with a mask composed of a head cover of cloth treated with an alkaline solution. The known affinity of chlorine for the alkalis brings about a chemical reaction that destroys, or at least attenuates, the irritating effect of this gas upon the lungs. These masks were fitted with a disk of talc to permit vision; but as this disk was easily dimmed and frequently broke, a new mask was devised, made of stronger cloth and provided with glass for the eyes. As time went on improvements were made. The masks delivered to the troops in Aug, 1915, carry opposite the mouth on the interior,

**ASPHYXIATING GASES—Continued**

a tin tube, 8 cm. long, and 2 in diameter. This is prolonged on the exterior by a rubber appendix, carrying a sort of valve, which can be opened only from the interior to the exterior. On taking the tube into the mouth when the mask is worn, one is obliged to breathe through the nose air that has been filtered by the mask itself, and compelled to expel it through the mouth. The valve just spoken of prevents the entrance of air.

The lower edges of both masks are tucked under the collar of the tunic in order to exclude the poisoned air. English troops always have with them these two masks. The improved model is carried outside of the uniform, slung from the shoulder so as to be available at a moment's notice. The other is kept in a pocket placed inside the left skirt of the tunic in case the first mask should fail. Strict orders have been given that troops should always carry with them both masks in order to use them as soon as the presence of gas is reported by the sentinels stationed in the first line of trenches for this purpose. The alkaline solution appears to lose its preventive effect after three months, hence all men are required to mark in an indelible fashion upon the pockets the date at which they were delivered. These preventive measures have succeeded in reducing losses due to gas. The result is merely a new complication in the equipment of the soldier.

[Asphyxiating Gases and Inflammable Liquids in the Present War. By "F. B." *Revista de Artilharia*, July, '16. 3500 words.]

(A brief account of the composition and manner of using these devices, with a reference to the old question of responsibility for starting the practice.)

See also

**RESPIRATORS****—From Mine Explosions**

[Gassing Accidents from the Fumes of Explosives. *The British Medical Journal*, Jan 20, '16. By Louis G. Irvine, Johannesburg. 6500 words.]

An excellent article interesting to line officers as well as medical officers. Gives account of the death of some and poisoning of many others from the gases of explosives in mines. The effects do not come on at once, but from six to eight hours later. They are due to the irritating effects of fumes containing nitrous and nitric acids, the result of imperfect combustion.

**—Use of in European War**

[The Armies. Aircraft Fights in the West. *Army and Navy Gazette*. Feb 12, '16. 400 words.]

In a bombardment of the German trenches in Champagne by French guns early in Feb, gas reservoirs containing asphyxiating gases were demolished, thus releasing quantities of gas which was blown on the German lines.

(The rest of the article chronicles air engagements, of which there were twenty-eight on Feb 5.—Ed.)

[The Second Battle of Ypres. Asphyxiating Gases and Guns of 30 k. m. Range. By X. *Rivista di Cavalleria*, Nov, '15. 3600 words.]

Asphyxiating gases conquered on a battle field for the first time at 5 p. m. on April 22 (1915), when the Germans attacked a French division after vigorously bombarding its position. Field Marshal French in his report stated that the occurrence baffled description. The effect of the vapor was to make all action impossible and to impede sight. Hundreds of men became comatose and in less than an hour the entire position with about 50 guns had to be abandoned. No censure whatever is to be attached to the troops who gave up the position.

At 10 a. m. on the 23d contact with the enemy was resumed by the French and Canadians, on a new front. The struggle continued on the 24th, 25th and 26th. On the 27th the English dispatch reported that violent fighting continued with no change in the general situation, that the Germans had secured possession of S. Julien and that both sides had suffered heavy losses.

On May 24, at 2:45 a. m., after a rain of projectiles and a discharge of gases, a new attack was made against the English position at Ypres. Many soldiers were asleep and had no time to put on their protective appliances. Two regiments were driven out of their positions and could not regain the lost ground.

However, the advantage gained by the Germans was only temporary, and in the end they were forced to abandon their project of a move upon Calais. Dunkirk was bombarded at a range of 30 km. This was done for moral effect but produced no strategic results whatever.

The gases not only caused death but also produced great suffering. The men were seized immediately with an intolerable irritation of throat, nose and eyes, violent choking and severe pains in the chest, accompanied by uncontrollable coughing. Many fell and rose no more. The greater part of those who escaped were sick for several days and many of these after apparent recovery succumbed to pulmonary diseases.

For some days immediately preceding the 22d of April, the German bulletins mentioned the use of stupefying or asphyxiating gases by the Russians, French and English. This was evidently done to throw upon the Allies the blame for beginning the practice.

After the great outcry in the Allied and neutral press against the action of the Germans in using these gases, the German legation in Berne issued a statement claiming that the French had authorized the use of similar gases Feb 21, 1915, two months before their use by the Germans. However, the gases authorized by the French caused no permanent injury, but merely sufficient discomfort to force the enemy to leave his trenches.

Later experience with the German gases, in July, 1915, showed that they had been modified so that their effects were not fatal.

[Asphyxiating Gases. By G. E. Rivista *Militare Italiana*, Feb, '16. 1500 words.]

At Malancourt, Feb 27, '15, and at Vauquois, Mar 23, the Germans made use of burning liquids in attacking the advanced French trenches. The liquid was petroleum kept under pressure in cylinders resembling portable fire-extinguishers; its employment was not due to chance, but was sanctioned by authority, as appears from order 32, Oct 16, 1914, Saint Quentin, giving special rules for the employment, by engineer troops, of liquids producing smoke and flame. The apparatus used throws a sheet of burning liquid 20 meters long and 20 broad, and contains enough fuel to last one minute and a half to two minutes—it is so constructed that the flow may be stopped at will, and thus enables the operator, with a single filling, to direct his fire upon several targets. (An account is then given of the employment of asphyxiating gases, already treated in the *Digest*.—Ed.)

\* \* \*

A good mask (against gas attack) must:

1. During respiration, completely exclude the poisonous gases.
2. At no instant prevent breathing.
3. Be simple, so as to be rapidly adjusted, and put on; it must not be cumbrous, since each man must constantly have one upon his person.
4. Be flexible in type, in order to fit variations of conformation of the head.

Whatever the respirator used, the absorbent must be hyposulphite of sodium, in the ratio of 200 grammes to the liter of water; and as this salt is affected by light, the solution must be kept in yellow bottles. This method of supply may offer difficulties at the front, so that it is perhaps simpler to issue the hyposulphite in solid form preserved in paraffin cases.

## ATTACK

See also

INFANTRY—ATTACK

TACTICS—INSTRUCTION AND TRAINING—

TACTICAL PROBLEMS—ATTACK

TACTICS—INSTRUCTION AND TRAINING—

MAP PROBLEMS—ATTACK

—Combined Arms

[Offensive Organization. By Lieut. Colonel Alsager Pollock. *Journal of the Royal United Service Institution*, Feb, '16. 6500 words.]

### I. INTRODUCTORY.

When active operations are in progress, it is always imperative that each important unit shall have a definite mission, representing a task, or share of a task, which it is deemed capable of accomplishing.

The commander of a unit to whom a special mission has been given, must frame his plan of action strictly in accordance with the strength and composition of the forces at his disposal, without counting upon reinforcements. He may not assume that assistance will without fail be forthcoming even in the case where he has been informed by his chief that his mission is a most important one. The bat-

tle may develop in a manner that will render his mission of less importance, and even make it advisable to sacrifice his command.

Operations having been projected against an enemy, the dangers and difficulties of the enterprise will first be considered and the strength and composition of the force required to overcome them determined accordingly. The calculation will, of course, be based upon the assumption that the commander of the army will keep his force united, avoiding wide dispersion. An army corps marching on good roads will not be allowed to isolate itself by outstripping others marching under more difficult circumstances, so that a tactical situation, when developed, will not be prejudiced by strategical irregularities.

In the battle itself, victorious units will not be allowed to thrust themselves forward, ignoring the inability of others to conform, and, isolating themselves, become liable to destruction by counter-attack. It is well for an army to prosecute its success against the enemy, but a small unit, pushing forward unsupported by the units on its flanks, risks annihilation in the salient which it creates. The commander of a victorious unit should at times suspend temporarily his advance, and holding fast to the ground that has been gained, should safeguard his flanks by sending his reserves against the flanks of those hostile bodies which are impeding the advance of his friends.

There is no doubt that isolated adventures are more often productive of damage than of advantage, but reasonable scope must be allowed to individual initiative. Well calculated daring is a corner-stone of victory, and skilled valor must not be too tightly restrained.

Each unit in battle must concentrate its efforts on the accomplishing of its own mission, but mutual support is always requisite. Fire and movement are always interdependent. Without covering fire there can seldom be a successful assault, and without the assault, or fear of it, there can never be a decisive victory.

### II. FRONTAGES OF ATTACK.

The proposition which it is sought to establish is this:

*Every unit to which a specified frontage of assault is assigned, should be entitled, ipso facto, to proprietary rights of supremacy within the parallelogrammic area subtending that frontage.*

To illustrate the practical application of this thesis, assume that a company, of those furnishing firing line and supports, has put platoons 1 and 2 in the firing line and 3 and 4 in support. Each of the platoons 1 and 2 has its frontage, divided into two or four section frontages. As men come on the line to reinforce from the other platoons in support or from the other companies in the battalion reserve, they become members of the sections which they join, and those sections retain their original numbers and frontages. Thus the command, "No. 1, Prepare to rush—Rush," will always set in motion all men who are within the frontage of No. 1 section. Moreover, the commander (if an officer) of

**ATTACK—Continued**

a platoon that has originally been put in the firing line, should retain command of the platoon frontage, though he may be junior to a subaltern commanding a supporting platoon that has joined his own.

Continuity of command and organization are of great importance in action, not only in respect to platoons, but also in the case where companies, battalions, brigades and larger units are involved. Certainly, in the cases of major units, continuity of tactical control is of immense value. The officer on the spot has had his finger constantly on the pulse of the fight, he thoroughly understands the situation, and is therefore better qualified than a newly arrived officer to frame plans for further action.

Thus we are in a position to state two ruling principles:

(1) *The officer by whom operations are commenced on whatever extent of frontage, should continue to direct them, subject only to the orders of the officer commanding the greater unit of which his own is a part.*

(2) *Commanders of adjacent units should not fail to confer, so as to insure intimate co-operation, generally and particularly, but, on the other hand, such commanders should not, except in cases of emergency, give any orders, by virtue of seniority, one to another. Differences of opinion should, except in grave emergencies, be referred for decision by the officer commanding the major unit to which both belong.*

**III.—ARTILLERY.**

The work of the artillery of an attacking force is divided into two parts: the first, *Preparatory*; and the second, *Co-operative*.

The objects to be achieved during the preparatory phase are:

1. To inflict upon the defending infantry such moral and physical losses that they shall be rendered incapable of offering effective resistance to the assailants of their positions.

2. To win superiority over the hostile guns, so that after the enemy's position has been stormed, the victorious infantry, when further prosecuting their advantage, may continuously be supported by echelons of artillery sent forward for that purpose.

When the defenders are subjected to a heavy bombardment, the tendency will be to withdraw most of the garrison from the fire trenches, the bulk returning after the bombardment has ceased, in time to meet the assault. To damage the communicating trenches must, therefore, be an object of the attacking artillery. The bombardment should be divided into periods so that during the lulls the defenders may be tempted to reoccupy the fire trenches, with resulting losses when the fire is resumed.

In the co-operative phase the attacking artillery must insure that the victorious infantry shall not be repulsed by counter-attack from trenches already captured, and must support unceasingly the efforts made to achieve complete penetration of the hostile position. The

latter of these two duties is a very difficult one. It is by no means an easy task to follow the infantry in its further advance and be constantly in position to prepare for and support its various assaults. However, if care is taken beforehand to select the best routes and positions with reference to the probable course of the operations, much may be done to reduce the chances against the artillery. In many cases it will be possible to prepare under cover of darkness positions to be used on the morrow. The field artillery may be advanced during the day; but not so the heavy batteries, unless exceptionally favored by circumstances.

In any case, the infantry must not be left without the support of the artillery, and the latter must find a way to "get there," without such losses as would cause them to arrive inefficient.

In studying the question of efficient means of communication between the infantry and artillery, it appears that there is strong reason for us to take again into favor the system of visual signalling. Such a means of communication is absolutely necessary at times when the telephone wires are cut or have not yet been connected.

**IV.—RESERVES.**

The objects which reserves are intended to achieve are:

1. To make good the successes won by other troops;

2. To turn the balance, by timely intervention, when victory is in doubt;

3. To avert disaster by covering the retirement of troops that have been repulsed.

Reserves should be posted so that the critical moment will find them ready to act as effectively on the offensive as on the defensive.

The undetected arrival of reserves is much to be desired, but the present day system of aerial observation has made it very difficult to avoid discovery when concentrating large bodies of troops in the vicinity of the enemy. Even if we could gain command of the air, it would only suffice to prevent aerial reconnaissance on a large scale and would be an unreliable safeguard against the adventures of single aviators, intelligently discreet as well as bold, and provided with fast machines. The only expedient seems to be night marching, and this only partially meets the case, since the enemy will often learn of the move through the spies that infest the country.

Even more important than the undetected movement of reserves is the timeliness of their arrival. The primary consideration is to avoid being too late. In order to do this, reserves should be not more than one hour's march from the trenches at the hour chosen for the assaulting troops to quit those trenches in order to attack. Since in this position they would be under fire of the enemy's heavy guns, and would be deprived of the rest and sleep which have been declared so necessary, it is best that they be marched to positions about five miles from the trenches during the second night preceding the assault. Having arrived at this position in time to conceal themselves in

villages, woods, etc., before daybreak, they spend the day resting and sleeping, and the following night are advanced until the heads of their columns are one hour's march from the trenches. In this manner the reserves arrive on time, well fed and rested, and perhaps undetected.

When practicable, railways should be used to still further augment the available forces on the spot. An army can never be too strong, and it is always well to have as large a margin as possible over and above the strength estimated to be sufficient. Napoleon's words on this subject were, "When you have resolved to fight a battle, collect your whole force. Dispense with nothing." If complete success is to be gained, it is essential that reserves shall be piled upon reserves, up to whatever may be the limit of available forces.

#### —Frontal

[How May the German Front be Pierced? By X. *Revue Militaire Suisse*, Feb and Mar, '16. 12,000 words.]

In the first place, can it be pierced? The answer does not seem doubtful. It was done twice, in Artois and in Champagne. Advantage was not taken of the results, but it was done.

A certain captain of the 153rd French Infantry named Laffargue was among those who thought it impossible. He had seen the Germans fail in the battles of Nancy and Ypres and so was prepared to see failure in the French attack of the 9th of May, 1915, in the direction of Douai. The success of this attempt caused him to change his mind, and his conclusions have been published to the Army. He was on the front for nine months, and his thesis and criticisms are worth study. A summary follows.

#### I

Every attack should be prepared by artillery. This has been objected to on the ground that a cannonade cannot fail to awaken the attention of the defenders. A surprise attack at night is favored by some. In this case, the artillery intervenes with a curtain of fire to prevent reinforcement of the first line trenches.

In general, however, artillery fire seems indispensable for destroying the entanglements, and they must be destroyed at the last moment. Other means are relatively inefficient, and the explosive shells of the 75 are the usual agent.

The pause between the fire for the destruction of entanglements and the curtain fire is the moment ordinarily seized by the defender to man his first line trenches. As shells falling in these trenches at that time are particularly effective, the following stratagem has been frequently employed: After having fired violently on the first line trenches and the barbed wire, fire is suddenly discontinued, and the cessation lasts 5 or 6 minutes. The defenders expect the "barrage" next, but, instead, firing is resumed at exactly the same objectives. This stratagem has cost the Germans a number of men, and, in consequence,

they have become wary. Still, it seems to be efficacious to simulate the attack several times and to launch a real one only after several false alarms.

The difficulty is that, whenever possible, the Germans collect in very deep shelters, upon which the 75 has no effect. The inaccuracy of high angle fire militates against the use of heavy artillery for their destruction. Recourse is had to aerial torpedoes and asphyxiating gases.

It is the rule now to attack between "centers of resistance," or strongly organized points of support. Direct attack on these points is almost sure to fail. In attacking the less well-organized parts of the line, it is necessary to annihilate these points of support by heavy artillery fire, but even this is powerless entirely to demolish a village, and hence must concentrate its efforts upon the edges. Laffargue says: "If a veil could be thrown over these centers of resistance and the view of flanking organs cut off, the problem would be partly solved. It would be necessary, then, to have projectiles giving out heavy smoke, which would spread over the ground and would be slow to dissipate."

As the heaviest losses to assaulting infantry are inflicted by machine guns, an attempt must be made to destroy them before the attack. Their emplacements must therefore be determined beforehand. They have certain characteristics; for example, in the trenches their loopholes are longer than ordinary loopholes. Sometimes they are set up in a small separate work. They may be looked for in re-entrant angles and on culminating points, permitting tiers of fire over the first line.

Several emplacements, indeed, may be prepared for a single machine gun. Many artillerymen therefore are afraid of wasting ammunition on them. In fact, it often takes a great number of shots to reach the small space occupied by the machine gun. To destroy effectively these machine guns, guns at 1500 meters should be assisted by others in the trenches themselves. The mountain 80 seems the right type. Direct fire should be used at short distances.

As to silencing the enemy's artillery, Laffargue says: "It seems that, knowing the *presumed* emplacements of the batteries, the best thing to do would be to deluge them with fire without any warning. The personnel are not continually at their posts, and this sudden fire surprises them and keeps them in their shelters." The service of the pieces, of course, suffers. The emplacements of these enemy batteries may be made untenable by shells giving off clouds of smoke or asphyxiating gases. Aeroplanes might complete the preparation by indicating the enemy batteries which are not silenced, this by means of luminous balls.

These suggestions have not been welcomed by the technicians. Such means of spotting batteries seem to them too inaccurate, and they are convinced that satisfactory results cannot be obtained without observation of shots.

### ATTACK—Continued

Captain Laffargue is not very definite as to whether it is well to bombard suspected areas or to fire only at definite objectives. It is a question of possible moral effect against waste of ammunition.

#### II

When infantry assaults, the artillery must cease its fire upon the trenches that form the objective of the attack. Its duty now is to shell the second line of defense, to bar the road to reinforcements, to silence guns or machine guns which have been unmasked to support the defenders.

There should be some means of suppressing the machine guns that suddenly enter into action. Touch is lost with the field artillery as soon as our own trenches are left. The first waves of the attack should be followed, after the capture of the first line trenches, by light pieces, 37s, for instance, drawn by their cannoneers.

Laffargue would impose this duty upon the artillery, but the artillerymen claim that they cannot spare officers and non-commissioned officers for this purpose.

Let us consider the operation at the moment when the attack is launched. The infantry has to approach the first line of defense, which consists of several parallels. Naturally, the artillery must immediately cease firing on the first parallel, for otherwise its infantry comrades would suffer more than the defenders. There is even risk, when fire is lengthened by 50, 100, or 200 meters in order to reach the second parallel, of hitting their own troops.

The garrisons of the second and third trenches do not generally occupy their posts of combat, but remain in resting places which they leave only at the moment of the attack, in order to reach their firing positions. As long as the artillery preparation lasts, they do not stir from these shelters, but abandon them precipitately as soon as there is a calm, unless a feint is suspected. The artillery must then extend its fire to the second and third parallels, and continue it while the infantry enters the first parallel, the communicating trenches and their intersections.

This fire has, besides, the advantage of keeping the defenders of the first parallel down; they are not reassured by the terrible sheets of explosive passing close over their heads.

A "barrage" by ordinary shells demands a great outlay of ammunition. The Germans have solved the question more simply by establishing a curtain of asphyxiating gases.

Aeroplanes drop bombs to cut railroads leading to the enemy's rear and thus prevent reinforcement. And the artillery does not cease to bombard all points that might permit the passage of troops or convoys at this critical period.

#### III

A grave question is that concerning the start of the infantry attack over a wide front. Evidently, the artillery preparation must vary in its effects at different points, complete here,

practically nil there. As the morale of the waiting troops must be considered, since they are under high tension, the tendency is to give the signal prematurely rather than run the risk of giving it too late. And, therefore, the assailants penetrate certain points without difficulty, while they are stopped at others. The line of contact is consequently irregular and wavy.

Experience has proved that the telephone cannot be depended upon for transmitting orders at critical moments. So the hour of the attack is usually decided beforehand. Even tho this seems brutal and unintelligent, especially to troops facing a sector where the artillery preparation has not been effective, no means of signaling has been found practicable. If, thru mistake, the batteries do not lengthen their fire, the infantry is subjected to the most cruel condition that can arise in war. This unavoidably happens so often, due to errors caused by invisibility of troops, difficulty of communication and uncertain information on the general situation, that it is prevented wherever else possible. Hence, the attack at a designated hour.

Therefore, the infantry officers have their eyes fixed on their watches, regulated beforehand. Zigzag passages have been opened (at night) in the wire entanglements and steps have been cut in the parapet opposite these openings. When the moment comes, an officer takes the lead. The men follow and form line in front at half-pace intervals. And this human wall rushes forward, as soon as the artillery ceases firing, trying to reach the enemy before he has got out of his shelters.

However, if the distance to be covered is rather great (more than 100 meters, for instance), Captain Laffargue recommends attacking by waves of companies. The first wave is divided into two parts, viz:

1st. A line of skirmishers at 5 paces, formed either by a deployed section or by groups of skirmishers (resolute, cool men) furnished by each section;

2d. Fifty meters in rear, the *attacking line*: men in one rank, elbow to elbow or at one pace intervals, with company commanders and chiefs of section, *in front of the line*, and file-closers, 4 meters behind.

In this case, one cannot count on surprising the enemy. He will open a more or less violent fire,

The thin line of skirmishers is intended to protect by its fire the attacking-line which keeps its elbow to elbow alignment and does not fire until almost the last moment.

The units come out of the trenches at quick time. Then they take a slow double time and make rushes of from 80 to 100 meters. The charge is taken up at 60 meters from the enemy.

Keeping the alignment is of great importance during the advance.

When the enemy's entanglements are reached the men can no longer be prevented from firing; they cross the entanglement individually and begin again to fire. Then the officer leads the assault on the trench. It should be

thoroly cleaned out; not a man capable of doing any damage should be left behind.

The first trench conquered, the first wave of attack forms lying down ten meters beyond and opens fire on the second trench.

For the first wave, *there is no limit*: let it go as far as it can.

The second wave should leave its trench as the first enters the enemy trench. If sooner, it would become involved in the attack by the first wave. While the first wave drives straight forward and cannot avoid the enemy's surprises, the second and third waves, warned by the experience of the first, may take certain precautions, such as obliquing the sections that would be exposed to the fire of machine-guns not yet silenced.

This is Captain Laffargue's description of the assault. Some parts of it impress us as being literary rather than practical. It is difficult to imagine soldiers emerging in single file and deploying before rushing forward, being careful to keep their alignment. We had supposed that the main reason for keeping an alignment was so that the men could fire. But they cannot, if their officers are in front. We are inclined to think we have a particular case under our eyes, and it would seem that the commanding general makes a mistake, if he considers it authoritative. In different circumstances and on different ground, the procedure must vary, and other evidence should be sought.

Apparently, the first wave must lose some of its dash after it penetrates the unknown ground beyond the first trench.

In addition to the fact that it may be intimidated by the dangers beyond, there is the tendency among some chiefs to use the second wave to consolidate points won by the first and not to follow up the first in its progress.

Supposing that the first wave is able to continue its advance and that the second and third are following without being diverted, it is necessary for the first wave to establish a series of parallels of departure. These may already exist, but frequently it is necessary to establish them in the open. It is a good idea to have the men fill their sand bags at the last shelter, putting in stones which, tho of small volume, stop bullets.

Attacks conducted in this way have succeeded in piercing the line. The question arises, however, as to whether it is a durable success or simply an ephemeral one. Successful surgical operations are not unknown, under which, nevertheless, the patient dies. In the military operation of making a breach, it is not the patient who is exposed to this catastrophe, it is the operator. He falls buried by his triumph like Samson under the ruins of the temple.

Before the centers of resistance the struggle is deadly. The first line has delivered its effort; it has barely penetrated the centers of resistance, capturing particularly the outer edges; in the intervals, on the contrary, it has spread out widely. But it has stopped out of breath before the second line of defense, because of unsilenced flanking fire from the

centers of resistance. This phase of the combat may last perhaps less than an hour.

It is then that the second line appears: it advances in successive waves of thin lines, preceded by numerous machine-guns and light guns. They have followed the first line and are silencing the machine-guns. The accompanying batteries have gone forward at the time of the taking of the first trenches, rapidly oriented by the signals of special agents, artillerymen who follow the infantry. The rest of the artillery intersects the approaches by a "barrage" of asphyxiating shells, and fires on the second line of the enemy.

It is in this manner that the first line arrives in proximity of the advanced elements of the first enemy line under cover of a sufficient fire. Certain of its units have the mission of overwhelming the centers of resistance by completing the control of their outer edges. They should not penetrate them, for a center of resistance is a filter into which battalions and regiments may be poured and from which only a few drops come out.

Certain units pass thru the intervals and arrive before the second line of defense, which is not usually continuous. They come in contact with sudden resistance or encounter spaces which they penetrate boldly and push straight ahead. The units stopped organize the assault rapidly without worrying about maneuvering. Soon the second line is overpowered. The supporting points, in the second line, as in the first, are simply isolated by the taking of their edges.

Now it is the turn of the reserves to clear up the last resistance which rallies about the enemy's reinforcements. "Officiers de liaison" notify the chief of the points where the reserves are needed.

Finally, they have reached the zone that is free of enemy troops, the gigantic assault of 5 or 6 kilometers is over. Now, surprise, rapidity of movements, skill in maneuvering will spread the panic.

The chance to get thus far does not happen often. At any rate, it does not seem that the German offensive had the opportunity, either in the battle of the Yser or in the battle of Verdun.

It is presumptuous to think that others can succeed where the generals and soldiers of the Kaiser have failed. And the difficulty of piercing a line properly defended seems to be proved. It is well not to consider the case where there is no resistance; no special measures would be needed in that case. Against a solid enemy, it may be almost affirmed that it is useless to take special measures for executing the attack, because it is bound to fail, whatever one may do. Either the line cannot be pierced; or, if it is, one is not in a condition to profit by the success attained.

Captain Laffargue's descriptions, reflections, and advice, therefore, appear to be much more literary than military. The reader may judge for himself.

See also

EUROPEAN WAR—MILITARY LESSONS OF THE  
(Article: "War Notes," Sept, '15.)

**ATTACK—Continued****—Naval***See***NAVAL OPERATIONS—ATTACK****—On Entrenchments**

[The War. Notes on the Assault of Trenches. (From Instructions Published in a Sector of the Western Front, Furnished by a Participant.) *La Guerra y su Preparación*, Madrid, July, '16. 3000 words.]

The attack of a fortified position includes generally the four following phases:

- I. Deliberate advance to the zone of assault.
- II. Occupation of the enemy lines.
- III. Consolidation of the positions occupied.
- IV. Extension of the conquered zone.

**I. DELIBERATE ADVANCE**

If the trenches from which the advance is made are not at a convenient distance for the assault, an advanced position must first be occupied. On account of the risk of loss, the distance to be covered should be as short as possible, from 40 to 130 m. If the distance exceed these limits, the assaulting troops will suffer heavy losses, not merely because of the increased duration of the exposure, but also because the enemy will have had time to line his trenches. He will particularly seek to do this when the artillery fire ceases, or must be extended so as to permit the troops to advance; it is then that men leave their shelter and bring up machine guns in as great numbers as possible to repel the adversary.

Proximity to enemy lines must not be exaggerated, however, because it may then be impossible to shell the hostile front without exposing one's own troops to considerable loss.

It is to be inferred that when opposing lines are wide apart, an advanced trench must be established by night; or if by day, by opening a series of zigzags, whose heads will then be joined together so as to form a trench.

**II. OCCUPATION OF THE ENEMY LINES**

This phase consists (a) of preparation; (b) of the assault proper.

(a) *Preparation.*—Before beginning an assault, the following points must be carefully heeded:

1° Easy communications must be prepared in advance, in as great number as possible, as they will be of the greatest value to the assaulting troops, once they have occupied the advanced enemy trenches. This condition may be secured by opening forthwith saps against the advanced points of the enemy, in order to reduce the quantity of work remaining to be done. The ideal would be to carry the heads of these saps to within 10 or 15 yards of the most advanced enemy saps, thus leaving an insignificant amount of work to be done to establish the communications desired.

2° The strongest points of the enemy position, such as shelters and machine-gun positions, must have been located in advance by air-reconnaissance, telescopic observation, night patrols, or by any other useful way.

When it is recollected that a very few machine-guns, suitably covered, may check the attack of an entire division, the importance of this precaution is realized.

3° Guns and troops must concentrate as far as possible without the knowledge of the enemy. In order to accommodate the troops necessary for the assault, it may be necessary, at times to construct various successive lines of trenches with small shelters behind the first line. To deceive the enemy, it may be found profitable to establish similar but dummy trenches on other parts of the front.

4° An endeavor will be made to establish as close to the line of fire as possible, depots of cartridges, hand grenades, sandbags, wire, planks, sheets of corrugated iron, so as to use all this material as soon as the enemy position shall have been carried.

5° For the rapid execution of the attack, passageways will be opened in the accessory defenses of the assaulting side; scaling ladders, planks and other means of sallying from the trenches will be provided for the attacking troops.

(b) *Assault Proper.*—Three distinct periods are to be noted, to wit, destruction of enemy entanglements; suppression of enemy fire; and the actual attack.

The best method so far of destroying entanglements has been to use shrapnel and H. E. grenades. It has been completely demonstrated that this method will succeed, if the bombardment be of sufficient duration, and close with the greatest intensity and precision possible. Other methods have been followed, such as mines, bombs, etc., but these are all slow, and cannot be rapidly applied, as always required, in the few moments that precede an assault.

In general, the condition in which entanglements are left by an intense bombardment varies greatly in different parts of the front attacked. At one point, they will be completely destroyed, at another they will be intact. Hence we may always expect the existence of certain obstacles that must be destroyed by hand; hence also the necessity of suppressing the enemy fire while these residual obstacles are being destroyed.

The extinction of the enemy fire will have been caused chiefly by the preparatory bombardment intended to destroy the defenses; but long-range guns must lend their help by battering the opposing artillery and at the same time establishing curtains of fire to cover the access to the positions of the defense. During the preliminary bombardment, attention must be especially given not only to the line of trenches, but also to the shelters, centers of resistance, and machine-gun emplacements, for the material and moral effect of the bombardment should prevent the troops of the defense from acting with promptness and vigor. It is of the first importance to extend the bombardment to both flanks of the position to be assaulted. For otherwise, the enemy, remaining hidden in these portions of the line, may take under enfilade the neighboring troops.



In the critical moments of the assault, the enemy fire may be suppressed by hand grenades, to be thrown when within some 30 m. of the trenches to be occupied. This sort of fire will be found especially useful in the destruction of such parts of the accessory defenses as may have escaped from the bombardment. Asphyxiating gases and inflammable liquids may also be of some use; but their employment to-day is of no great value, because of the preventive measures that can now be applied. In the beginning, the surprise they caused produced real results; this is no longer the case.

The foregoing conditions satisfied, the success of an attack requires:

1° That the entire assaulting forces shall move out simultaneously upon a concerted signal.

2° The vanguard of these forces must be equipped with hand grenades and the tools necessary to complete the destruction of the obstacles that may still remain. It may even be necessary, or at any rate wise, to furnish them adequate means to cross these obstacles, such as thick boards, etc., necessary whenever trenches have to be passed.

3° The first line of the advance will almost certainly be annihilated at certain points, whence the necessity of a second line, equipped like the first.

4° A third line must come on, to settle the issue in the moments of the inevitable confusion that follows upon contact with the enemy; to neutralize any immediate counterattack; and to continue the advance for the purpose of occupying, if possible the second line of trenches. Counterattacks against this second line can best be checked by artillery fire.

5° Each echelon of the attacking forces must be accompanied by small squads of grenadiers, who immediately upon setting foot in the enemy trenches, must bombard the shelters occupied by the enemy, extend the position taken on both flanks, and inspect the communication trenches.

An effort will be made to send material stores and supplies with the second and third lines. If this be impossible, they must nevertheless be sent forward, as soon as circumstance permit, without loss of time.

### III. CONSOLIDATION OF THE POSITIONS OCCUPIED

The assault having been carried out, the resultant situation will in general be as follows: the greater part of the enemy line will be occupied, leaving in his hands, here and there, certain points of the front. This is offset by the success of a few groups in reaching the second and perhaps the third line of trenches, the greater parts of which, however, will be held by the enemy.

As soon as the advance has stopped, suitable measures must immediately be taken to consolidate the terrain occupied, by putting it into a condition to beat off the counterattacks that are sure to be made. This consolidation comprises two distinct things: supply of the garrison, and measures to be taken to contain counterattacks.

*Supply of the garrison*—The garrison from the outset must be supplied with hand grenades and rifle ammunition in great quantities; construction materials and tools (picks and sand-bags) for the building of trenches opposed to the enemy; and machine-guns in the greatest possible abundance. If possible, all these elements must follow immediately in the wake of the columns of assault. Troops will need food, water and reinforcements: hence the immediate establishment of communication trenches, suitably covered, between the captured position and the trenches left behind; telephone material must also be provided.

*Measures to be taken to contain counterattacks*—Barricades must be built in the enemy's communication trenches, and also in the portions of the line still held by the enemy, as for example on the flanks of the captured position. Of equal importance are all the measures needed in the modification of the captured trenches, to utilize them against the enemy, such as constructing new banquettes, and transforming into parapets the earthworks that covered his rear. In respect of his accessory defenses, as some of these will be unhurt, and many are transportable, they must be transferred to the other side of the trench, either at once, or during the night. But the troops of the attack must take with them other defenses to the position occupied, and install them by night.

### IV. EXTENSION OF THE CONQUERED ZONE

This may be extended in two directions, in flank or in depth.

*In Flank*—It is essential to clear the parts of the captured trench still occupied by the enemy. The most rapid means of doing this consists in sending expert grenadiers in pairs, and accompanied by men with fixed bayonets, along the trench until the enemy is reached, when the grenades will be thrown; the work will then be finished with the bayonet. Two or three repetitions of this procedure will bring about either the destruction or the surrender of the enemy. The only known means of resisting this sort of attack consists in barricading the ends of the trench sector attacks. When so barricaded, they must be regularly assaulted, preferably from the side toward the main enemy. If these assaults should fail, there is no other recourse but to cut off communication between these occupied sectors and the main position.

*In Depth*—This result may be secured, as was the case at Neuve Chapelle, by attacking three or four lines of trenches with the greatest rapidity. But this is possible only if the system of trenches have no great extension, or be weakly held. Otherwise, recourse must be had to *systematic attack*, successfully employed, it would seem, by the French. This consists in the selection of a definite objective, for example, the second line of hostile trenches, and of concentrating upon it an attack of the greatest intensity; if it succeeds, measures are taken to prevent counterattacks that might recapture the position. The first objective having been gained, a

**ATTACK—Continued**

second is chosen after suitable reconnaissance to insure success. By repeating this procedure, the position captured may be extended by successive efforts.

**AUSTRALIA**

*See also*

DECORATIONS AND REWARDS, MILITARY—  
AUSTRALIA

**—Army**

*See also*

DISCIPLINE

(Article: "An Army Strike.")

**—Expeditionary Force for European War**

[Australia and the War. *Australian Mil. Jour.*, Jan, '16. 23 pages of tables.]

These tables give in detail the organization and strengths of the various units despatched from Australia up to Dec 31, 1915. Examination of these tables shows that the force comprised two divisions. There were eight infantry brigades, four light horse brigades, together with all auxiliary units of engineers, artillery, signal troops, hospital corps, army service corps, bridging train, etc. These units were kept at strength by reinforcement of all arms.

The tables show a total of 4350 officers and 132,877 of other ranks, a grand total of 137,237.

[Note. *Army & Navy Jour.*, Mar 26, '16. 200 words.]

With a population of 5,000,000, Australia has raised a military force of 245,000 men, 140,000 of whom are at the front. The Labor Premier of the Commonwealth stated to a correspondent of the *N. Y. Sun* that this showing had been made possible by the fact that Australia had a system of compulsory military training. Ability to defend home and country is a prime duty of citizenship and it is not possible to trust wholly to volunteers.

*See also*

EUROPEAN WAR—LOSSES—AUSTRALIA

EUROPEAN WAR—NOTES ON OPERATIONS IN  
SOUTHEASTERN THEATRE—THE DARDAN-  
NELLES

(Article: "Australians in Action.")

RECRUITING—EXAMINATION AND STANDARDS  
—AUSTRALIA

**—Expeditionary Force for European War—  
Sanitary Service**

[Australians in Action: Operations at the Dardanelles. Letters from C. E. W. Bean, Australian Press Representative with the Australian Imperial Force. Letter XXVI. The Surgeon. *Australian Mil. Jour.*, Jan, '16. 1900 words.]

Criticisms of the breakdown of the hospital transport arrangements in the early days should not include the Australian medical service at Anzac, which is worthy of all praise. The men who have been responsible for this work had almost all been in the Army Medical Corps before the war, and understood the organization of a war service, getting wounded from the front quickly, clearing them rapidly to the base, getting stretcher bearers and

stretchers back to the front, etc. This work does not require a great surgeon, but a man of business capacity, and the man *par excellence* for this class of work is the younger surgeon who is, or has lately been, superintendent or registrar of his hospital. The sanitation specialist has his place on the staff or as regimental surgeon. The expert surgeon belongs in the field ambulance, the hospital, or hospital ship, and he should not be wasted in a hospital full of minor cases. It has been suggested that army surgeons should be divided into first, second and third-class operators, which would serve to indicate the class of duty for which they were fitted. The system should insure that each man is put at his proper work. Such a system has been in operation at Anzac.

The organization of the medical service in campaign requires mental agility, and the successes have generally been those of younger men. The man with most experience of military medical organization is the hospital superintendent. The practice has been to appoint these junior men to junior posts and seniors of high standing, but not necessarily of hospital or military experience, to the most responsible commands.

If a transport were in charge of two surgeons without military or hospital experience, the chances are that they would devote their attention to the wounded as they came aboard and thus become speedily swamped. This condition is compared with that where the space aboard had been investigated and designated by suitable names. As the wounded come aboard they are given sufficient scrutiny for classification, whence results a well arranged ward system in which the best attention can be given with the least total delay.

The Australian medical service worked faithfully, but was handicapped by faults in management outside. On the lines of communication surgeons and hospitals labored under conditions and difficulties which, even under war conditions, it is difficult to believe were necessary.

**AUSTRIA**

*See also*

HORSES—BREEDING OF—AUSTRIA

**—Army**

*See also*

AUSTRIA—WAR DEPARTMENT

EUROPEAN WAR—FORCES ENGAGED

**—Food and Commodity Prices and Supply**

*See*

EUROPEAN WAR—FOOD AND COMMODITY  
PRICES AND SUPPLY—AUSTRIA

**—History**

*See also*

SEVEN WEEKS' WAR

GREAT BRITAIN—HISTORY

(Article: "England and Austria. A  
Retrospect")

**—War Department**

[The Austro-Hungarian War Department. Communicated by Karl Franz Schaller, Spanish Consul at Vienna. *La Guerra y su Preparación*, Aug, '16. 7000 words.]

(This popular and non-technical article consists mainly of generalities upon the vast increase in the labors of the War Department since the outbreak of the war, and is unsparing in its praise of the efficiency displayed. These generalities call for no special notice here. We shall remark upon only one or two features.)

A delicate question has been the care of the cripples, widows and orphans of the war. The law has been modified so that not only the completely incapacitated (as under the old law) shall be considered as cripples (*inválidos*), but also those whose ability to work shall have been reduced 20 per cent. Thousands of soldiers are thus entitled to pensions, who formerly would have received nothing. The totally incapacitated will receive hereafter a pension of 600 crowns. Widows unable to work, and those having the care of young children are entitled to pension as *inválidas*.

Even in time of peace, the War Department had a press bureau, maintaining certain relations with persons controlling the press. On the outbreak of the war, this bureau passed, so to say, to a war footing; one of its duties now was to prevent the publication of news that might be of advantage to the enemy. The press bureau prepares all the notices to be given out by the press.

A censorship was also created, consisting of five officers and of a number of clerks, whose business it is to pass upon and if necessary to expurgate various publications. At the head of this censorship is a general officer, who at the same time presides over the section called "Inspection of War Matters," and who publishes edicts dealing with extraordinary measures. This department is composed of experts representing all the branches of the War Department and of the central authorities, with the result that it is easy to publish, in accord with the various ministries, the exceptional measures that may seem proper.

An auxiliary organ of the Minister of War is the Presidential Office (*Præsídial-Bureau*) headed by Lieutenant General Von Bellmond; the function of this office is to keep alive in the army that military and martial spirit at times more valuable in war than the number of combatants and of guns. This office is thus charged with the conservation of the ethico-moral virtues of the army, and constitutes a bond between the War Department and the Emperor's Military Cabinet. All questions of importance considered by other sections of the ministry are submitted to it for opinion and approval.

The Second Division of the War Department deserves mention. Into the receiving bureau come daily more than 2300 documents, handled by 25 officers. These sort, classify and distribute. Memorandums drawn up, but not signed, are sent to the dispatching office, where fair copies are made and necessary translations from foreign languages. It frequently happens that a given paper must be sent to 3000 distinct offices, at the front and in the country.

Provision has had to be made by the War Department for the reception of the 3000-4000

persons, who daily, from all parts of the Empire, press for admission to the Department, in order to get information and relief, and make known grievances and troubles. Eight officers stationed in a large hall of the ground floor of the War Ministry deal with the most urgent cases and are authorized to give passes to the persons whose business requires them to penetrate more deeply into the recesses of the Department.

The personnel of the Ministry consists of 687 officers and 598 military and civilian employees. The Minister of War is General Baron Von Krobatin, of the artillery, an expert of the first order in matters relating to this arm, and whose qualities in general have ever kept him in the view of the authorities. It is to him that the Central Powers are indebted for the Skoda 30.5-cm. mortar. As Minister of War, he has had, since the outbreak of the war, to solve the munition problem, as grave in Austria-Hungary as in other countries at war. Thanks to his energy, the soldier in the trenches may fire without fearing that cartridges will be lacking; the commander of a battery need not count his shells lest they should fall short at a critical moment.

#### AUTOMOBILES

[Military Automobiles. *Memorial del Ejército*. (Madrid.) Oct, '15. 4500 words.]

The present war has given an opportunity to theorists to moralize on the various phases of the combat; and to attempt to deduce conclusions to support favorite ideas. One of the principal lessons, however, beyond the realm of theory, is the importance of the explosion motor as applied to engines of war, not the least of which is the automobile.

Before the outbreak of the war the four cylinder, four cycle (4-stroke cycle) motor, was considered the ideal. Varieties of this model were on the market, but in essentials they were the same. Since the opening of the conflict certain modifications have been made, especially by American factories. The factories of the belligerents have clung more conservatively to the former models, probably from necessity; but elsewhere the six, eight and even twelve cylinder motors have become popular. This has led to a modification in the aeroplane and other motor service with the European powers. In England the Green motor, of 300 h. p. and 600 lbs. weight, the only model genuinely English, has been the guiding type in the application of the *twin-six* to aerial machines and automobiles.

The increase in the number of cylinders carries with it a diminution in the number of moving parts, resulting in greater velocities with lessened vibration. In addition, the use of aluminum and magnesium in the iron and steel has decreased the weight.

Nearly all the American factories have reduced the cost of motors; and at the end of the war thousands of motor vehicles of all kinds will suddenly be available for domestic purposes—all of which will have a tremendous influence on the use of such machines.

## AUTOMOBILES—Continued

Automobiles in Spain have not reached the same point of development and use as in other countries. One great reason for this is the poor system of highways; and besides, Spain does not produce sufficient gasoline for domestic consumption. Hence the problem confronting the military authorities there is to provide depots as strategic points for the accumulation of an adequate supply. Bombardment from aeroplanes is always possible, and for protection against this danger the gasoline itself should be of the quality known as "non-explosive," and the reservoirs must be small and spread over a wide area. For local protection of each tank there should be trees for concealment and nets overhead to catch bombs.

Other countries use, in addition to gasoline, carburetted alcohol and benzol, which would be valuable for Spain if their manufacture were encouraged.

There are only two automobile plants of any importance in Spain, and one of these is of recent beginning and small output. The other is not well located strategically, and it is not to be recommended that government support be given, for military purposes, to a factory so located and under the control of a powerful private corporation.

In England the automobile industry has reached such proportions in private hands that the government has no concern for its ability to secure the necessary transportation; and the tests under governmental supervision have never been carried on so extensively as in France and Germany. Just before the outbreak of the war the Automobile Association of England carried 1000 men, with all their baggage and equipments, from London to Hastings, 100 kilometers, in three hours, with a limited number of vehicles; and as soon as the first expedition under General French commenced preparations to embark for the continent a veritable flood of automobile transportation was available immediately. In the year from June 1914, to June 1915, the United States sold to France nearly 5500 automobiles and to England nearly 14,000.

Nearly all the continental European nations have solved the problem of automobile transportation in campaign, by having constantly in service enough for immediate necessities, and by making requisition on the civil population for additions.

The extraordinary traffic by motor vehicles required by the service conditions causes rapid deterioration of roads. In England certain highways leading to Channel ports were set aside for exclusive military use, to lessen the damage as far as possible.

In regard to the size of military motor vehicles, Germany favors the larger sizes, carrying four tons or more, while England inclines to those of about two tons capacity. One essential, however, for military purposes, is uniformity in size. Some countries have experimented with still heavier vehicles, with capacity of as much as ten tons, but here the

question of bridges interferes; and even permanent bridges sometimes collapse under the excessive loads, while temporary bridges always suffer. The engineer must calculate his bridges after the other military authorities decide on the size of the vehicles.

See also

## MOTOR TRANSPORT

## —Armored

[Automobile Notes. Armored Fighting Cars. *Scientific American*, May 27, '16. 125 words.]

Great things were expected of the armored automobile a year ago. Where armies are moving it is of great value, but its usefulness is small when the armies have dug themselves in. Ammunition and supply cars that have to go up to the front are now frequently armored.

[Note. *Army & Navy Jour.*, July 8, '16. 100 words.]

U. S. Marines have found great need for armored automobiles in recent operations in Mexico, Haiti, and Santo Domingo. Armored automobiles cradled in seagoing rafts may be added to the regular equipment of naval vessels. Experiments have shown that this would be practicable.

[Armored Caterpillar Tractor. *Army & Navy Jour.*, Sept 23, '16. 750 words.]

In the battle of the Somme on Sept 15 there was revealed a British armored motor car capable of advancing over the rough terrain resulting from the terrific bombardment by high explosive shell. These cars proved to be American built caterpillar tractors heavily armored, and their effect was reported to be extraordinary. The British official bulletin calls them "heavily armored motor machine-guns of a new style." The soldiers call them "Willies" and the correspondents call them "tanks." The Holt Manufacturing Co. of Peoria, Ill., has sold about 1000 caterpillar tractors to the British government. Their information is to the effect that some of these were used as the basis for the "tanks." Lloyd George gives the credit for the idea to Winston Churchill. Newspaper dispatches credit Col. Swinton and Maj. Stern, British army, as being the inventors.

[Armored Tractors in the European War. *Scientific American*, Oct 7, '16. 2000 words. Illustrated.]

The lurid accounts of the work of the armored tractors in the battle of the Somme have led to incredulity. Great Britain has purchased about 1000 American-built caterpillar tractors of 60 to 75 horsepower. Germany and Austria had purchased a few of these before the war.

In commercial use, these caterpillar tractors have shown their ability to make their way through and over the tangled branches of fallen trees in clearing land for the Ashokan reservoir. In the same work trees 8 to 18 inches in diameter were uprooted by pull on

cables. In the Everglades reclamation work, trees 6 to 7 inches in diameter were overridden or broken off.

Single tractors of 15 tons weight and 120 horsepower have been built. It is suggested that possibly the British mechanical armadillos are carried on four caterpillar tractors coupled laterally in pairs. This would give 400 to 500 horsepower and a weight of 60 to 75 tons.

["Land Cruisers" in the Battle of the Somme. *Scientific American*, Oct 28, '16. One illustration.]

(A photo of the "tanks" is reproduced. It is the same picture that has been reproduced in other periodicals. The two outside wheels are described as being behind and used for steering purposes.)

The vitals are contained in an armored box, and the two tractor belts extend the full length. There is an upward slope of the belts and body at the front, enabling the tank to start up a steep slope or climb out of a hole. On each side is a sponson mounting three machine guns.

#### AVIATION

See

AERONAUTICS

#### BALKANS, European War in the

See

EUROPEAN WAR—SOUTHEASTERN THEATER—  
—THE BALKANS

#### BALKAN WARS

See also

EUROPEAN WAR—GENERAL NOTES ON OPERATIONS, BY THEATERS—SOUTHEASTERN THEATER

#### —Use of Cavalry in

See

CAVALRY—USE OF IN BALKAN WARS

#### BALLISTICS

[Some Ballistic Investigations. By Col. P. Haupt, Retired. *Artill. Monatshefte*, July-Aug '15. 20,000 words.]

(Note.—This is an abstruse mathematical discussion, in which the author rigorously discusses the limitations and application of the well known theorems of Taylor and of McLaurin, and Lagrange's formula for the remainder after the  $n$ th term, to ballistic investigations. It is of interest only to ordnance officers and others engaged in mathematical studies. Only the author's conclusions are given.)

1. In Taylor's series, Lagrange's formula for the remainder gives only approximate and wide limits when using simple algebraic processes; but by integration, a very exact value for the remainder is obtained.

2. The Taylor-McLaurin series gives only approximate values but very reliable ones, becoming more exact with the number of terms. It permits easy algebraic computation according to the powers of  $x$ , which is a great advantage and is quite impossible in integration.

3. Lagrange's formula for the remainder is very useful for an early ending of McLaurin's series.

4. Whereas Taylor's series is indispensable in theory, McLaurin's series is absolutely necessary in practice.

5. Due to the failure to make use of McLaurin's series in all empiric or semi-empiric methods, the latter are usually very deficient in definite and convenient equations and formulae.

See also

ANTI-AIRCRAFT ARTILLERY—BALLISTICS

ARTILLERY—FIRE

BOMBS—AERIAL—BALLISTICS OF

FIELD ARTILLERY—BALLISTICS

INFANTRY—ARMS—RIFLE—BALLISTICS

INFANTRY—FIRE—BALLISTICS

TRAJECTORY

#### —Determination of Data—Apparatus for

[A Ballistic Scale. By A. von Huberth, C. E. *Artill. Monatshefte*, June, '15. 4800 words. 5 illus.]

(Note.—This is a description of the construction and use of a very ingenious apparatus to determine accurately almost all the data necessary to the solution of equations and formulae in interior and exterior ballistics. The author shows the application of his methods by carrying out his investigations completely in one or two cases. The article is not susceptible of thorough condensation. It should be of absorbing interest to all ordnance officers, or those intending to make experiments.)

It is a misnomer to designate this apparatus a ballistic scale, which expression is used only because the apparatus permits nearly all ballistic data to be determined. It consists of two parts,—a recoiling gun platform and an armored car, both mounted on tracks and bearings. The gun is mounted on the gun platform, and is bored through in several places for the introduction of fine copper wires. A pressure gauge is screwed into the gun tube near the front of the chamber. This gauge consists of a steel tube bent at right angles, carrying a piston which acts against a helical spring and operates a registering electro-magnet pen which records the pressure graphically upon a drum. Mercury is used to prevent the escape of the gases around the piston. The recording drum is covered with paper and circled by five thin brass strips covered with lampblack. This drum is operated by a chronometer and recoils with the gun. The different points of the gun tube are connected electrically. The discharge of the gun breaks the first circuit and starts the registration of a recording induction-chronograph, time interval 1-1000 of a second. These intervals are recorded on the first brass strip. The pressure curve is recorded on the paper. As the projectile passes through the bore, the different wires are cut and these breaks in the circuit are recorded upon the next brass strips. The impact of the projectile upon the armored car is recorded upon the last strip.

The energy of impact is measured by determining the velocity of this armored car.

In an appendix, the method and the apparatus used in the adjustment of the helical pressure spring and the manner of construct-

**BALLISTICS—Continued**

ing a table to assist in determining the pressure values, are described.

In the equations given in the article, the following symbols are used.  $P$ =pressure or force of compression;  $f$ =amount of compression of spring;  $G$ =torsional modulus of elasticity;  $S$ =maximum permissible stress;  $r$ =mean radius of the helix;  $d$ =diameter of the cross section of the spring;  $n$ =number of turns in the spring. Also  $Pk$ =mean powder pressure;  $p$ =acceleration;  $Vk$ =muzzle velocity;  $G$ =weight of the projectile;  $M$ =mass of the projectile and half the powder charge;  $L$ =the weight of the powder charge.

[The Ballistic Scale of Hubert. *Mem. de Artilleria*. (Spain.) Jan, '16. 2500 words. 4 illus.]

(Based upon an article in the *Artill. Monatshefte*, June, '15, digested above.)

**—Effect of Wind**

See also

MORTARS — RANGE FINDING — EFFECT OF WIND

**—Formulas**

[Monomial Formulas for Pressure and Velocity for Ordnance and Small Arms Firing Colloid Powders. By Captain J. H. Hardcastle, R.A. *Jour. Royal Artillery*, Oct and Nov, '15. 12,000 words. 9 tables.]

(This article is a technical study on interior ballistics and cannot be digested intelligently without giving the computations.)

In a previous article in the *Royal Artillery Journal*, Nov, 1909, the author showed how to reduce the labor of calculating problems in interior ballistics when using Ingall's method, and how to adapt his formulas for slide rule working. The present article proposes to show how to shorten the method even more, and to piece on to it an independent expression for the maximum pressure, adapted from Charbonnier's formula, and so to obtain formulas of the greatest simplicity for ascertaining the effect of varying any of the six principal dimensions of the gun and charge, viz.: the weight of the charge and of the shot, the capacity of the chamber and the size of the cordite, the shot travel and the caliber.

The formulas are cast into the monomial form of a set of percentage alterations.

**—Interior**

[Concerning the Effect of Instantaneous Gas Pressures Upon the Change in Form and Elastic Strength of a Gun. By M. Pilgram, Ord. Const. *Artill. Monatshefte*, Jan, '16. 7500 words.]

(This is a scientific and mathematical discussion of the effects of the stresses acting upon a gun, and is impossible of condensation. It is of interest to ordnance constructors only.)

**—Muzzle Velocity**

[A Few Words on the Measuring of Muzzle Velocities. By Lt. Alfr. Sjökvist, R. C. A. *Svensk Kustartilleritidskrift*, Vol. 2, Part 2, '16. 2100 words.]

(The ordinary method by means of the Le Boulangé chronograph is described.)

**BALLOONS**

[Military Ballooning. *Army & Navy Jour.*, Oct 14, '16. 300 words.]

The Aviation Section of the (U. S.) Army Signal Corps has recently organized a division to develop types of free, captive and dirigible balloons. Fort Omaha has equipment for the purpose, and may be used as an aeronautical station. All officers interested in balloons are advised to apply for assignment to this duty. Kite balloons have been extensively used on the western front for observation of artillery fire.

See also

AERONAUTICS

DIRIGIBLES

HYDROGEN—PRODUCTION OF—FOR BALLOONS  
KITE BALLOONS

**BANDS, Military**

[Good Music in the Army. By Capt. A. J. Dougherty, 24th Inf. *Infantry Jour.*, Jan, '16. 500 words.]

A regiment finds its expression through its band. The power of music as a factor in the upbuilding of the morale which spells victory has been all too frequently underestimated. Good bands add to the general popularity of the service, and are a powerful factor in securing enlistments.

The band should contain at least 36 instruments, and its leader should be a commissioned officer. Foreign governments recognize the condition, and their band leaders are lieutenants or captains. We do it in the case of the Marine and Constabulary bands. Why are these bands so much better off in this respect than army bands?

**BARBED WIRE ENTANGLEMENTS**

[Wire Defensive Entanglements. *Army & Navy Jour.* Dec 25, '15. 300 words.]

*La Nature* describes a new wire entanglement.

"It consists of two coils of very great diameter, sometimes four or five feet, of one-sixth inch wire, wound in opposite directions and entangled with each other. At many points where the windings of one spiral cross those of the other a ligature is made, and the network is thus formed. The first turn is fastened in front of the trench by a stake, nicknamed "the frog," and by grasping the opposite end of the spiral it is stretched out parallel to the trench and fastened at various points by other "frogs," in a manner similar to pulling out a weak spiral spring. Two or three of these compound spirals are placed before a trench, and the action of artillery and explosives is quite different on these Brun spirals from what it is on the ordinary barbed wire entanglements. The more the enemy bombards these spirals the more the different coils become entangled, forming an inextricable jungle.

[Official Photograph, French, June 17, '15.]

This photograph shows a portion about 6 m. long of a first line trench, about 100 meters

from the German lines, in the Bois de Bisel, Alsace. It brings out clearly the present practice of placing the barbed wire entanglement immediately in contact with the foot of the parapet, as distinguished from the prescription of the French F.S.R. to place them about 100 meters in front. In the present instance the presence of the Germans at that distance would have prevented any observance of the regulations, but this close position of the entanglement is general, and prevents or tends to prevent, the cutting of the entanglement by night in comparative safety. The interior crest of the parapet is formed by a log about 12 cm. in diameter: the superior slope is about 1.3 meters broad. The interior slope is wattled, and the trench deep enough to cover the entire body, leaving the head and shoulders exposed. The front of the position is filled with forest trees, between which wires have been passed, so that the entanglement shown is substantially many meters wide.

#### —Destruction of—Wire Cutters

[Rifle Attachment Wire Cutter. By Maj. R. L. McClintock, R. E. *Royal Engineer's Jour.*, Dec, '15. 1300 words. 4 figs. 4 photos.]

The use of the ordinary pliers for wire-cutting interferes with the proper handling of the rifle. This is a wire-cutter attachable to the service rifle and bayonet, and designed to cut any strand of a wire fence by the simple act of lunging at it. The attachment consists of four parts,—pliers, guide tube, lever, and spring. It is readily fastened to the piece by the mere act of fixing bayonet, with the ordinary use of which it does not interfere. In delivering the lunge, the wire is guided by the flat of the bayonet into the jaws of the cutter. Upon the spring being compressed, the jaws sever the wire, and are instantly released for another lunge.

It is claimed for the cutter that it can cut thicker wire than the hand-pattern pliers, due to its greater leverage; that a wire entanglement can be destroyed more rapidly by its use, and without laying aside the rifle. It is only adapted, however, for cutting taut wire or wire which will resist a thrust.

[Methods of attachment and use illustrated.]

#### —Special Gloves for Handling

[“Ware Wire!” *Army and Navy Gazette*, Feb 19, '16. 300 words.]

The barbed wire we use [in England] is bad enough, but the kind the Germans use is much worse. It is a work of no small difficulty to drag aside the loose strands which even the most efficacious bombardments leave in front of the German trenches, and unless absolutely destroyed it is impossible to penetrate their entanglements. There are now on the market “S.O.S.” (=save our skins!) gloves, which are sufficient protection to the hands to enable even the German barbed wire to be handled with impunity.

#### —Use of in European War

[Barbed Wire at the Front in 1916. *Sphere*, July 22, '16. 1500 words. Illustrated.]

Attention is focussed upon guns and munitions, but a large part of the munitions is used against barbed wire. The importance of machine guns cannot be denied, but it is the deadly pause and crowding at any undamaged barbed wire which give the machine guns their opportunities for decisive action.

The use of barbed wire in vast quantities has been developed in the present war. The quantities required were underestimated by the Germans, and more so by the other belligerents. Formerly laboriously collected from fences, the divisional supply now is measured in tons per day. Much of the building of entanglements is now done in the immediate presence of the enemy. Formerly, methods were laid down for daylight work. Now methods are those suitable for use at night, on ground pitted by shell holes, perhaps with machine guns only a hundred yards away. Not only must the entanglement be built, but it must also be kept in repair. When close to the enemy, the best time to work on the barbed wire is when the enemy is working on his. Then it is a case of “Wire and let wire.”

The well-known high and low entanglements are described. The latter can be effectively used in wiring old shell holes, as was done on several occasions, notably at Loos.

In the early days, a simple wire fence was often all that could be provided. With sloping wires pegged out on each side it becomes the “apron” entanglement.

Nowadays trenches are on an average 150 yards apart. In some cases they are so close that the barbed wire entanglement is common property, useful to whichever side is on the defensive at the time.

With speed, silence, and small working parties as conditions, entanglements have had to be modified. One that can be made up in rear and carried out and placed in position is much used. One form is the “knife-rest,” which consists of two X-shaped trestles connected by a pole 8 to 12 feet long. The points of the trestle stand about 4 feet off the ground. Horizontal wires connect the points of the trestles. A spiral wire is wound around the cage and additional wires are added if necessary. Two men can carry a section. The sections are carried out and wired together in position. Two or three rows may be used.

The Germans favor short iron rods with corkscrew ends for posts. They display great skill and bravery in placing their entanglements. Very thick wire has been used. In other cases, shell-holes and concealed trenches have been wired, and they (Germans) have even contrived to put out fresh wire during our (British) final fierce bombardment. Nothing can cope with the wire but an ample supply of guns and ammunition.

#### BARRACKS

[An Account of the Construction of Barracks, Hospital Buildings, Stables, Gymnasiums, etc., in Sweden. By Col. C. Lundquist (conclusion). *Tidskrift i Fortification*, parts

**BARRACKS—Continued**

5 and 6, '15. 6500 words in this no. 14 tables giving cost of construction, etc., etc.]

(This gives a detailed account of the construction of barracks, officers' and non-commissioned officers' quarters, hospital buildings, reading rooms, stables, bathhouses, laundries, riding halls, gymnasiums, etc., in different parts of Sweden, some built of stone and some of wood, with tables giving in detail the size, method of construction and cost of the buildings, the kinds and cost of heating and lighting apparatus, kitchen equipments, gymnastic apparatus, etc., etc.)

[Economy in Sheltering Troops. By 1st Lieut. Robert C. Cotton, Signal Corps. *Infantry Journal*, May, '16. 2000 words.]

Economy in sheltering troops may be said to be the frugality of expenditure in the erection, upkeep, and maintenance of shelter for troops.

Canvas is the most costly shelter we can use for sheltering our troops for periods of time when the shelter tent is deemed insufficient.

The first cost of a light, comfortable frame building is less than that of canvas, and such a structure will outwear several sets of canvas.

The building proposed for 100 men is 360 feet long by 20 feet wide, with a roof sloping one way.

**BATTLESHIPS****—Non-sinkable**

[Rumor of an Unsinkable Battleship. *Proceedings United States Naval Institute*, Nov-Dec, 1915. From *Seven Seas*, Nov 1915. 400 words.]

Submarines and Zeppelins having failed of their purposes, the German Admiralty is now giving its attention to the production of an unsinkable battleship. Such a ship is at present secretly building in one of their naval plants.

So far as can be learned, the plans of this ship provide for three outer bottoms, the first eight inches, the second four and the third or inner bottom one-half inch thick. The spaces between these skins are of varying dimensions and are filled with a secret composition which offers no resistance to the explosive powers of shell or torpedo. It is expected that the shattering power of a shell will be spent in its action against the non-resisting composition, so that it will never penetrate the inner skin.

The idea is not a new one, our own Navy Department having under advisement at the present time the plan for the construction of a non-sinkable ship.

To combat such a ship, the guns and shells in present use, based upon the idea of great penetration against objects of tremendous resistance, would have to be discarded for ordnance possessing longer range, less weight, and higher explosive power.

**BATTLE SIGHT**

See

INFANTRY—ARMS—RIFLE—SIGHTS

**BAYONET**

[Bayonets and Bayonet Combat. By 2d Lieut. T. M. Moore, 19th Inf. *Infantry Journal*, Mar, '16. 4600 words.]

The bayonet has not received the attention it merits. A cutting, thrusting weapon seems, in some occult way, to be considered as un-American. A glance at a muster roll will show that the ancestors of many of our soldiers were infinitely more accustomed to the pike and the lance than to firearms, and, moreover, if the rifle be an American birth-right, it passed with the backwoodsman and the pioneer. We pride ourselves upon our adaptability and our progressiveness. Then let us prove it by showing ourselves to be capable of using the bayonet. Its importance certainly shows clearly in the evidence from Europe and in our own F. S. R.

As to bayonets, the French weapon is 3.7 inches longer than our own, balances as well, is more readily drawn from the scabbard, being held by springs only and is set more firmly to the rifle. It is constructed along more logical lines, being narrower and stronger, though if broken in the attack it still retains its deadliness for thrusting, which is the true function of a bayonet.

Fencing equipment should be carefully selected. It is an error to approximate the rifle too closely in weight and appearance, not considering at all the theory of the weapon's use. Balance should, of course, be about the same, and mobility and dexterity follow from the use of a lighter training weapon, not a heavy one. Initial resistance to a thrust must be afforded. The present training bayonet is too flexible. A bamboo foil, one inch in diameter, the length of a rifle and bayonet and padded to the size of a baseball at the thrusting end, weighted to secure balance, is an ideal training weapon.

Lessons in training are divided into three stages: 1st, with the rifle and bayonet, the guards, thrust, lunge and recover; 2d, with the stick, foot to foot training in the attacks and returns and foot work; 3d, with the stick, combat fencing.

(The descriptions of the stages, and of the various details are very complete, but not susceptible of useful condensation.—Ed.)

Final bouts should be made more realistic by having opponents separated twenty yards, and rushing at each other. Have several men, each one ten yards behind the leading man, charge the same opponent. This approximates actual conditions closely. Do not overlook the value of confidence as an asset in the use of bayonet. French soldiers are all trained with the foil, and it is believed that two months with the foil, then one with the bayonet, give results far superior to three months bayonet training alone. Under conditions of to-day, what chance and what confidence does the training in vogue give our soldiers, were they to meet experienced men-at-arms?

See also

INFANTRY—ARMS—BAYONET



**—Instruction and Training**

[Bayonet Fencing Materiel. By Captain J. B. Fabre, 126th Infantry (France). Extract, *Infantry Jour.*, Nov, '15. Plates. 1500 words.]

Three systems which have seemed to give best results are all stiff bayonets. The German system consists of a stiff bayonet set in the barrels of obsolete or condemned rifles. The tip is padded. This is very simple and inexpensive. It is used without plastrons. There are two types of mobile bayonets. One bayonet consists of a rod moving in a hollow casing fixed to barrel of rifle. This is used in the 119th Infantry. The 25th Chasseurs have applied the same principle: a hollow bayonet 30mm. in caliber surmounted by a wooden disk, projects from a wooden rifle of rough construction. The necessary weight and balance is secured by iron side plates on the stock. The bayonet is short and solid, cannot be bent, and has a play of from 10-20 cms. In principle, any system based on a bayonet having more than 50 centimeters play should be rejected.

[The Stiff Bayonet. By 2d Lt. C. N. Sawyer, 30th Inf. *Infantry Jour.*, Nov, '15. Photos. 3800 words.]

After two years of experience in combat and based upon an exhaustive study of all manuals that could be found in the same period, the conclusion is that the stiff bayonet is the only proper kind for training, and that the manual is not based upon practical principles.

The ordnance bayonet is too easily broken, and if broken during a lunge or thrust, may inflict an ugly wound; it is too flexible to parry an opponent; it does not lend itself to accuracy in that it slips off the part of the plastron struck; and lastly, it in no way imitates the regulation bayonet except in length. It should simulate length, rigidity, shape, stiffness, weight, and size, and also all effects except actual puncture of flesh.

The adoption of such a bayonet in the author's own company required time, but as success crowned all combat with the new bayonet, it came into general use. A change from the old habits of holding and using the weapon became imperative.

The right foot makes an angle of 30° with the front instead of 90°.

Low parry (right and left) were prohibited, as their use would mean a death blow from a trained antagonist. Weight is on the balls of the feet instead of the heels. The rifle is held well forward, right hand to right and in front of the left knee. Cutting edge of bayonet is down. This position eliminates one motion from the lunge or thrust.

In making the lunge or thrust, the left hand is kept firmly on the piece, and does not slide back.

The men prefer the stiff bayonet after the newness of the change wears off, and in the regimental competitions its use has greatly spurred interest in bayonet fencing.

Changes in the manual are needed along the

lines indicated. With a proper diagnosis and a simple co-ordinated treatment, bayonet fencing may yet take its deserved place as a contest and as a powerful factor on the battle line.

[The Tactical Importance of Bayonet Fighting, by Captain R. B. Campbell, Gordon Highlanders, *The Canadian Military Gazette* from *Globe and Laurel*, July, 1910. 1500 words.]

The big gun is responsible for the bayonet. Entrenching offers the only form of protection against artillery, and the only way to get a man out of a trench is with a bayonet.

The climax of the great European war will soon come and it will be a series of great hand-to-hand battles decided by the infantry with bayonet and knife, and with the artillery and cavalry of either side waiting to pursue or protect.

Training in the proper use of the bayonet is sadly neglected in spite of its tactical importance. Good direction with the bayonet is more important than good aim with the rifle, for the enemy may be fired at twice, but the first thrust of the bayonet must be effective. This thrust must be made at some vital point such as the face, throat, chest, abdomen, etc. A bayonet-thrust in any of these parts will usually prove fatal, and also the bayonet can easily be withdrawn.

Infantry officers are now issued both rifle and bayonet and must know how to use them. The main points to be noted in bayonet instruction are: An officer to supervise the training. He should have as many assistants as are needed. Half an hour a day is sufficient. This instruction goes hand in hand with other training and can be made interesting and attractive. Special attention must be paid to rapidity of action and to a vigorous attack.

**BELGIUM****—Army**

See

EUROPEAN WAR—NOTES ON OPERATIONS IN THE WESTERN THEATRE

(Article: "Operations of the Belgian Army.")

**—Army—Artillery**

See also

FIELD ARTILLERY—ORGANIZATION—BELGIUM

**—Fortifications**

[The Fortresses of Belgium and Their Fall. By B. G. *Tidskrift i Fortifikation*, Parts 1 and 2, '16. 7800 words and 3 maps.]

(This article gives an account of the situation and character of the fortifications around Liège, Namur and Antwerp, when they were built and their armament; and also a concise description of the attack and reduction of each of these fortresses.)

**—History**

See also

EUROPEAN WAR—WESTERN THEATRE

**BELGRANO, General Don Manuel**

[Personality of General Belgrano. Capt. Don J. D. Giordano. *Rev. del Círculo Militar*, Aug, '15. 4000 words.]

**BELGRANO, General—Continued**

General Don Manuel Belgrano was born in Buenos Aires in 1770. He graduated from the University of Salamanca in 1793. He took part in the revolution of May, 1810, and was a part of the first patriotic government. He led the expedition to Paraguay the same year. He died in 1821.

**BENZOL**

See

MOTOR TRANSPORT—FUEL FOR

**BLOCKADE**

See also

EUROPEAN WAR—NAVAL OPERATIONS

**—History of**

[The Methods of Blockade and Observation Employed During the Revolutionary and Napoleonic Wars. By Lieutenant Guy E. Cooper, R. N. *Journal of the Royal United Service Institution*, Aug, '16. Diagrams. 15,000 words.]

(An attempt to distinguish, by examining certain campaigns of the past, between blockade and observation, and to study the conditions which make each effective.)

**BLUE CROSS SOCIETY**

See

HORSES—CARE OF WOUNDED

**BOMBS**

See

GRENADES

**—Aerial**

[New Bomb for War Aeros. *Arms and the Man*, Oct 5, '16. 400 words.]

Experiments recently conducted by Army experts in a search for the most effective form of explosive for use in war aeroplanes have disclosed a bomb which is said to excel in destructiveness any similar weapon known here or in Europe. It is the invention of Mr. F. E. Barlow, an employee of the Frankford Arsenal.

The Barlow bomb is 6 feet in length and about 5 inches in diameter. It is shaped like a torpedo. In addition to an explosive charge of T.N.T., it contains a gas-chamber in which is used a new and secret combination of gas. Exploded over the heads of troops it will spread gases earthward over a large surface. It may be exploded in the air with full power, the time of explosion being regulated to a second by the operator of the aeroplane by means of an electrical timing device.

The bomb may be used either as a "drop" explosive or an aerial torpedo. Fitted with a new type of electric motor and propeller, it may be fired by the aviation operator horizontally or directed toward a target at any angle.

The bombs are to be attached to the undersides of aeroplanes and released by foot pressure on a trigger.

See also

DIRIGIBLES

**—Aerial—Ballistics of**

[Influence of the Earth's Rotation Upon Accuracy of Bombs Dropped from Dirigible Airships. By W. Krebs. *Artill. Monatshefte*, June, '15. 1000 words.]

Since the angular velocity is the same, an object at a height of 2000 meters will have a greater linear velocity than its corresponding projection on the earth's surface. This will cause bombs dropped from airships to strike farther to the east, depending upon the geographic latitude of the locality. This amount varies from 1-3 m. at Archangel, latitude 65°, to 2-3 m. in northern Italy, latitude 45°.

[The Effects of Projectiles from Aircraft. By S. Rst. *Tidskrift i Fortification*, Parts 1 and 2, '16. 1700 words.]

(A technical discussion of the velocity acquired and penetration of projectiles dropped from aircraft in a covering of brick, concrete and earth.)

**—Aerial—Launching of**

[Apparatus for, and Method of, Launching Aeroplane Bombs, Employed in the French Army. Communicated by Col. Echagüe and Lt.-Col. Benítez. *La Guerra y su Preparación*, May, '16. 500 words. Diagrams.]

The apparatus consists of a cylindrical sector, fixed to the fuselage, and provided with an alidade revolving around the center of the sector. This alidade carries at right angles to its extremity a rule so adjusted as to be, in any position of the alidade, in bearing on the curved surface of the sector; the rule is provided with two crossed wires serving as index. The curved surface is itself a scale, the graduations of which are formed by curves (segments of the cylindrical circumference) and right lines (elements of the cylinder). The curves form a time scale (seconds); the right lines an altitude scale (heights in meters). The zero of the scale is in the center and readings of altitudes are made to the right and left, with scale differences of 200 m. Upon the scale, starting at the zero, are plotted curves corresponding to the calibers of the various projectiles carried on board.

The point to be bombed having been selected, the pilot is directed to maintain his course, with or against the wind, at the same height and speed, and in a straight line upon the target. This position of the aeroplane must be assumed at a sufficient distance from the target to allow a preliminary observation to be made. These conditions satisfied, the alidade is set upon the line corresponding to the height of the aeroplane: the observer looks through the eye piece, and waits until he can see a clearly determined point in the same vertical plane as that in which it is desired to drop the bomb. As soon as this is the case, he starts a split-second watch, and moves the alidade to a second position symmetrical to that just occupied (i.e., to the same reading on the other side of the zero), and now waits until he can again see the clearly determined point through the eye piece. When he does so see it, he stops the watch, and thus determines the interval in seconds of time between two positions in the air symmetrically disposed with reference to a known and fixed point on the ground. He now moves the alidade to a third and last position determined by the intersection of the proper caliber-curve, and the

time-curve corresponding to the number of seconds just obtained, looks anew through the eye piece, and waits now until the real target comes into sight. As this moment arrives, he releases the bomb.

See also

#### AERONAUTICS

#### BOYACA, Battle of

[First Centenary of the Battle of Boyacá. By A. Arzayus, General, Chief of the General Staff. *Memo. Estado Mayor* (Colombia), June, '15. 1000 words.]

Circular letter announcing the purpose of the General Staff to prepare an extraordinary number of the *Memorial* in commemoration of the battle of Boyacá, which was fought Aug 7, 1819, and secured the independence of Colombia.

All interested are requested to submit articles on the strategy of the campaign, the organization and tactics of the contending forces, personal studies of the leaders and other superior officers participating in the battle; also photographs and maps of the battlefield, and other material pertinent to the occasion. This number of the *Memorial* is to contain 500 pages and will be profusely illustrated.

#### BRAZIL

##### —Army—Instruction and Training

[The Army in Campaign. By Major L. Bittencourt, Instructor of the School of Practice. *Boletim Mensal*, Jan, '16. 1400 words.]

In the Practical School the instruction for the second period, fourth group, will consist of, "The relation of the different arms, the formation of the great units, and the army in campaign." In this period of the school the instruction is to be entirely practical and little time devoted to the theoretical, with the exception of the organization of the greater units. This manifestly will have to be a theoretical study.

The program for the practical study of the fourth group of the second period, during the three years 1916-17-18:

##### 1st Part. Relations of the different arms

1. Technical importance of the group. The union of the three capital factors in combat. The arms in a good army. Strategic and tactical necessity for the union of the different arms.

2. Practical study of Infantry: The foot soldier, the arm, and accessory questions.

3. Practical study of Cavalry: The cavalryman, the arm, and accessory questions.

4. The practical study of Artillery: The artilleryman, the gun, and accessory questions.

5. Practical study of the Engineers: The sapper, matériel, and accessory questions.

6. Practical study of the Train: The officer in charge, the armament, a standard carriage.

7. Practical study of the General Staff: Officers of the General Staff, their duties, accessory questions.

8. Tactical organization. Organization of the principal factors of combat. Operation of infantry with other arms.

9. Independent organization of the different arms.

10. Organization of all the arms and services on land and sea.

##### 2d Part. Formation of the grand units

11. Study of the general principles of the organization of the Brazilian forces, with all the exigencies of a campaign.

12. Organization of a regiment of Infantry, of Artillery, and of Cavalry.

13. Organization of a Battalion of Engineers and of a "Train Squadron."

14. Organization of a Brigade of Infantry, of Cavalry, of Artillery and of a mixed brigade.

15. Organization of a Division of Infantry, in peace and for mobilization.

16. Organization of a Division of Cavalry, in peace and for mobilization.

17. Organization of a Corps, peace and war.

18. Organization of Army, for peace and war.

19. Combined armies.

20. Combination of land and naval forces.

##### 3d Part. The Army in Campaign

21. Unit organization. Practical employment of strategic units. Orders of battle, of the march, etc.

22. Method applicable to the practical solution of tactical problems.

23. Composition of the vanguard.

24. The vanguard in movement.

25. The vanguard in combat.

26. Composition of the Army.

27. Movement of the Army.

28. The employment of the Army in combat.

29. Practical study of the problem of war.

30. Rear guard.

##### —Army—Artillery

See also

FIELD ARTILLERY—FIRING REGULATIONS—BRAZIL

##### —Fortifications

See

FORTIFICATIONS—BRAZIL

#### BRIDGES, Military

[Construction of Submerged Bridges. (According to Directions from Engineer Headquarters.) *Revista Militar* (Argentine), June, '16. 800 words.]

(A method is given of constructing a sunken trestle bridge which hostile aviators would be unable to locate. Tables and formulas are included. The article does not permit of condensation.)

See also

RIVER CROSSINGS

##### —Bridging Equipment

[Regulation Bridge Matériel of the Belligerent Nations. *Memorial del Ejército* (Madrid), Oct, '15. 2000 words.]

*French.*—The regulation pontoon is metal (model 1901), but wooden pontoons are also used, these latter being of older models. The wooden pontoon is 9.43 meters long, .78 meter high and 1.76 meter wide; it weighs 660 kilograms, and its buoyancy is 8540 kilograms; while the metal pontoon is somewhat shorter

**BRIDGES, Military—Continued**

and narrower, but a little higher. It weighs 750 kilograms, and can carry a load of 9700 kilograms. The interval between pontoons in the bridge is 6 meters.

For reconnaissance and salvage work, a small, unsinkable metal boat is provided. It has, just below the gunwale, a strip of *capoc*, a kind of cotton which comes from India and which will not absorb water.

The trestle is the Birago, with legs adjustable between 2.3 and 3.9 meters in length, and weighs complete 170 kilograms. The remaining material is of the usual type.

Each army corps has two bridge trains divided between the divisions, each division having its train in two groups. Each train complete builds 100 meters of bridge, and the material is so grouped as to be easily divided, each section being complete in itself. Its mobility is the same as that of field artillery.

*German.*—The matériel is similar to the French. The pontoon is of zinc, 7.5 meters long, 1.5 meter wide, and .81 meter high; it weighs 450 kilograms, with a buoyancy of 6750 kilograms; and the interval between pontoons in the bridge is 4.5 meters.

The trestle is similar to the Birago, with legs adjustable between 3 and 4 meters.

The anchors weigh 43 kilograms and about 90 kilograms.

*English.*—The pontoon is of pine, dimensions 6.46 x 1.6 x .69 meters, covered with varnished sail canvas. It weighs 355 kilograms, and its buoyancy is 5900 kilograms. In construction it is more elaborate than either the French or German.

In addition to these pontoons, the English have a light folding boat of impermeable canvas, modeled on the Berthon system. The remaining matériel is essentially similar to the French and German.

*Austro-Hungary.*—The Birago system, with two-legged trestle and divisible pontoon, is used. The pontoon is of steel. The division into halves facilitates transportation; and, in assembling, the bottom is locked by hooks and the upper part by pins and bolts. This system, while it has certain advantages, has the disadvantage that the total weight to be carried by the train is greater than that of other countries, the weight and type of the remaining matériel being the same as in the French service. The method of supporting the balks on the pontoon is not so practical as with the other systems.

*Belgium.*—The pontoon, model 1874, is of hexagonal cross-section, of steel, with one end vertical to permit the coupling of two together. It will carry eight tons dead weight. The trestle consists of a cap piece with two legs, each a tripod, two legs of which have holes for pins, and at the vertex of the tripod the parts are locked by a bolt; near the bottom, the tripod legs are joined by an iron strap. The legs of the tripod being adjustable in length, the tripod itself is adaptable to irregularities of ground and is very stable, but is more than double the weight of the

Birago and offers greater resistance to the current.

*Italian.*—This is of the Cavalli system of 1871. The pontoon is divided, like the Austrian, and is of wood. The trestle is similar to the Birago and permits a variable length of span.

*Russian.*—The matériel is the same as the Austrian, with a slight modification in the shape of the pontoon, and with a different anchor.

See also

**RIVER CROSSINGS****—Suspension**

[A Graphic Calculation for Suspension Bridges. *Memorial de Ingenieros*, (Madrid), Sept, '15. 5000 words. Diags.]

We know that the form of a cable of a uniformly loaded suspension bridge is that of a funicular polygon which may be inscribed in a parabola, and whose form approximates to the curve increasingly with an increased number of suspension cords.

In accurate analytical discussions of the problem, there are deduced from the equilibrium of the system in general, and its distinct elements in particular, not only the equation of the parabola which enables us to trace the funicular polygon, but also the analytical formulas by which are found the length and necessary strength of the cable, suspension members, etc. These formulas solve the problem for us with exactness and must be employed in calculations for large permanent bridges, particularly in view of the fact that graphic methods can give at best only approximations.

For field work with troops, however, these formulas are not practicable:

1st. Because the minute calculations take too much time;

2d. Such exactness is not essential in hasty military bridges; and,

3d. The irregular quality of the material available nullifies exact calculations. Hence graphic methods give best results, and a few are mentioned. Some of these may be deduced from the parabola itself; but for simplicity the study is based only on the funicular polygon.

The most frequent case is that in which the cable supports (piers) are in the same horizontal plane. Having the suspension members equally spaced and the dead load uniformly distributed, and neglecting the weight of the cable and suspension members, we may suppose that each suspension member carries half the weight of the adjoining spaces between the members.

Letting  $N$  denote the number of spaces between suspension members (or the bays), the system will be in equilibrium under the action of  $N-1$  parallel forces, equidistant and equal to  $p$  (transmitted by the suspension members), and those at the extremities of the system. The forces at the extremities must be in equilibrium; in other words, the force polygon must be closed, and the tension of the extreme chords of the funicular polygon must be equal and in opposite directions.

If a right line  $D'D''$ , representing a force  $(N-1)p$ , is taken as the base of an isosceles triangle with an altitude  $OO'$ , found as indicated below ( $O$  being the vertex); and the line  $D'D''$  is drawn parallel to the direction of the forces  $p$  on the suspension members, the tension on the extreme chords of the funicular polygon will be equal and in a direction parallel to the sides of the isosceles triangle. The length of these sides also measures the tension, which may be represented by  $tn$ .

Drawing the extreme chords of the funicular polygon, then, parallel to the sides of the isosceles triangle; and, at the inner extremities of these chords applying the forces  $p$  and  $tn$ , we obtain the system of forces to be applied to the second chords. Applying these to the isosceles triangle  $tn$  being a side already drawn and  $p$  being laid off from  $D'$  on the base  $D'D''$ , we obtain, by closing the triangle thus representing this system of forces, a line  $OC'$ , showing in direction and representing in intensity the second chords of the cable. By continuing this graphic process all the chords of the funicular polygon are drawn on the plan, and the corresponding members of the isosceles triangle measure the forces applied to these chords.

The form which the cable takes is one of an infinite number of funicular polygons resulting from the system of vertical forces; and if there are given no more data than the span and the number of bays, the problem can be solved graphically by assuming an arbitrary polar distance  $OO'$  to the vertex of the isosceles triangle. Usually, however, the span, the sag, its number of bays, and the minimum height of the cable from the floor of the bridge are specified. The last item exercises no influence in the graphic solution, and is neglected.

(Analytical calculations are shown, forming the basis of further graphical solutions, first for bridges with an odd number of bays; and, second, for those having an even number—neglecting the height of piers, the anchorages, and the floor system, but assuming a maximum dead load and equal height of piers.—Ed.)

In the case of an odd number of bays, the central chord of the funicular polygon will be horizontal, and the polar distance  $OO'$  of the isosceles triangle is obtained from the formula

$$OO' = \frac{(N^2-1)l}{8f}p. \quad (\text{This formula is deduced by the author by a process of reasoning too long to reproduce in this abstract.—Ep.})$$

In this  $N$  and  $p$  represent values as above,  $l$  is the length of a bay, and  $f$  the sag.

When the number of bays is even the formula deduced by the same process of reasoning is:

$$OO' = \frac{N^2 l}{8f}p, \quad \text{in which } N, l, p, \text{ and } f \text{ are the same as above.}$$

When the piers are unequal in height, both the analytical and the graphical solutions become more complex. One great difficulty for the graphic solution is that the position of the lowest point of the cable is not exactly known. However, an approximation sufficiently close

for our purposes is obtained by drawing a right line between the pier heads, and assuming as the lowest point of the cable that point at the greatest vertical distance from the line so drawn. The line  $D'D''$ , of the isosceles triangle of forces, is then drawn parallel to the ordinate so determined and, in principle, the solution is as before.

#### Observations

1. The methods outlined are applicable to the construction of a "Bowstring" girder, in the particular case in which the arc is a parabolic polygon.

2. The graphic solution for suspension bridges shows us that the form of the funicular polygon corresponding to uniform loads is independent of the amount of the load.

3. The analytical study of the circumscribed parabola gives the same results as a careful graphic solution.

#### BRIGADE

##### —Tactics

[Brigade Exercises. By Arturo Maillard. *Memorial del Ejército de Chile*, Aug, '15. 3000 words.]

There are two formations for the brigade:

1. "Brigade in line of regiments in column of battalions," in which the regiments are formed side by side, with the battalions in the regiment one behind the other. In combat this has the advantage of allowing the regiments to fight side by side and of not mixing the units.

2. "Brigade in column of regiments in line of battalion columns," where the regiments are one behind the other, but the battalions in the regiment are side by side in column of companies. This formation gives one complete unit (1 regiment) as a reserve, but will mix the units when they reinforce the line.

Brigade exercises are for the training of the regiment in the larger units. This is accomplished by dividing the objective into sectors of combat, with communication between the parts. The regiment must act in conjunction with other regiments of the division. If they are not present, then represent them by flags.

The brigade commander must demand a correct interpretation of the mission from the regimental commanders, and the latter must direct and time their march so as to arrive at the proper moment, lend aid, or attack as the occasion demands. Communication must be kept with the brigade commander during combat, and information sent him of the situation and terrain. The same is true of the commanders of regiments and their subordinates. In all the larger units must be kept carbon copies of all orders given and notices sent. Adjutants of regiments will remain with the brigade commander until he gives his orders, likewise battalion adjutants will go to the regimental commander to get orders for their battalions. Brigade orders must always be written.

The brigade must be taught marching, deployments, combat exercises, advance and rear guard actions, attacks on prepared places and defensive exercises, also night attacks.

**BRIGADE—Continued**

When these exercises are against your own troops the opposing forces must be plainly marked by badges.

Regimental commanders should be given an opportunity to act as brigade commanders and battalion commanders as regimental commanders.

The division into sectors should be well marked as well as the direction of attack. In the northern part of our country this is very difficult, but in the center and the South trees and walls aid much. In Germany this is done by the aid of maps, but we must do it without.

Brigade commanders should have 20 mounted men for scouts and messengers, and each regimental commander 5.

The enemy should be another brigade and artillery, either real or outlined, for our infantry should be accustomed to firing not only by the side of artillery, but also against it.

**BRITISH EAST AFRICA****—History**

[Boat Actions and River Fights. By Commander E. Hamilton Currey, R.N. *United Service Mag.*, Sept, '15. 6500 words.]

(A historical account of two boat actions in East African waters in 1887-1888, with slave traders.)

**BRITISH WEST AFRICA****—History**

[A Statement of Events in Senegal and Gorce, 1758 to 1784. By Major J. J. Crooks, African Commissariat (Retired). *United Service Mag.*, Jan, '16. 3500 words.]

A record of the principal events by years from 1763 to 1778.

**BRUSILOFF, Gen. Alexei Alexeivitch**

[Brusiloff, Gen. Alexei Alexeivitch. *Information*, July, '16. Quoted.]

Gen. Alexei Brusiloff was born in Kutais in the Russian Caucasus nearly sixty years ago. He was the son of a soldier and came of a family distinguished in Russian military and political history. He was educated first in the schools of Tiflis and later at a Russian military school. He took part in the war against Turkey in 1877, but saw little actual fighting. At its close he became the right-hand man of Col. Vladimir Sukhomlinoff (later War Minister), who had been chosen to reorganize the famous Cavalry School for Officers at Petrograd. From that time he rose steadily until he came to command a section of the Cavalry Guard. During the Japanese war, Brusiloff remained in Europe.

Having served first as General of Brigade and General of Division, he became corps commander of the Fourteenth Army Corps, with headquarters at Lublin. Married early, and soon left a widower, he married a second time shortly before his transfer to Lublin. His second wife was Nadeja, the second daughter of Mme. Jelihovski, a Russian novelist. From Lublin he was transferred to Warsaw, but obtained a second transfer to Vimitza, southeast of Warsaw, and the com-

mand of the Twelfth Army Corps. When the European war broke out, Brusiloff drove back the Austrians under Gen. Auffenberg and captured Halicz, and later at the Lupka Pass in the Carpathians drove back the Austrian force which was attempting to relieve Przemyśl.

**BULGARIA****—Army**

[Bulgarian Rifles. *Arms and the Man*, Dec 9, '15.]

According to Russian information, the rifles used by the Bulgarian army are made after the Mannlicher and Mauser systems, the patterns of the latter having been captured from the Turks. The Bulgarians are thus able to use both Austrian and Turkish cartridges, having also thousands of rounds on hand for each type of rifle.

Further information is that the Bulgarians have 750 light field guns, including 300 75-millimeter Schneider cannon, and 150 rapid-firers of the same caliber, taken from the Turks, besides 250 Krupp guns of 87-millimeters, 150 Krupps of 75-millimeters, 40 120-millimeter Schneider rapid-fire howitzers, 40 Krupps of the same caliber, 25 150-millimeters Krupps, 30 rapid-fire 75-millimeter mountain guns, and 50 rapid-fire Krupps of like caliber.

**—Army—Staff****See**

STAFF (Article: "Composition of Headquarters," etc.)

**BULLET-PROOF CLOTHING****See also**

HELMETS—ARMORED

**BULLETS**

[Modern Bullets in War and Sport. By C. Marsh Beadnell, F.C.S., Fleet Surgeon, R.N. *Arms and the Man*, Nov 25, '15. Table. 1000 words.]

The bullet which readily alters its shape upon impact with the tissues of the body is called an "expansive" bullet. There is in reality no expansion, but rather a deformation of the bullet, and it would therefore more appropriately be called "deformative."

All unsheathed lead bullets are of this class, and sheathed bullets are often made deformative by various devices. Among these are the split-nosed, hollow-nosed and soft-nosed bullets. They are often erroneously called "dum dum," from the fact that the original deformative bullets were made at Dum-Dum, the fact that principally hard-nosed bullets are made at that place being overlooked.

Explosive bullets contain a charge of explosive which is detonated on impact with the body, and, exploding, causes great wounds, instantly fatal. They are used only in big-game hunting. Stories of their use in warfare are misstatements, due to ignorance of what constitutes such a bullet.

The modern Spitz-Geschoss bullet of the Germans produces less dangerous wounds than the Mauser of 1888. It has a remarkably flat trajectory, its height being only 11.75 inches at a range of 400 yards, as compared with 28 inches for the Lee-Metford of the English.

(A table is given, contrasting the English Lee-Metford and the German Spitz-Geschoss bullets.)

See also

DUM-DUM BULLETS

## BUZZER

See also

FIELD ARTILLERY — FIRE CONTROL — INSTRUMENTS—BUZZER

## CAMELS

[Napoleon's Dromedary Corps. By L. Fitz-Gerald. *United Service Mag.*, Nov., '15. 5000 words.]

In countries where camels live, they have been used in battle from very remote times. In his Egyptian campaign, Napoleon decided in 1798 to create a regiment mounted on dromedaries, to consist of two squadrons of four companies each. The soldiers were to be selected from the infantry, to wear a distinctive uniform, and to be armed with the weapons of the infantry plus a very long lance. The soldiers were to be mounted on dromedaries of superior speed and endurance. The dromedaries seem to have been easy to train, and no difficulty was encountered in accustoming them to firing, and to the drum and bugle.

This corps reached a strength of about 600 men and appears to have been a valuable military force. The usual day's march was about 72 miles. One case is cited of 500 miles in 8 days.

The Dromedary Corps remained in existence about 2½ years. Subsequently similar troops were raised in Algeria, and also in India. The latter force was disbanded in 1853, as it was considered too expensive.

## CAMPS

See also

WATER SUPPLY—FOR CAMPS

## CANADA

—Army

[Doing Their Bit in Canada. By Geddes Smith. *Independent*, Jan 24, '16. 4000 words. Illustrated.]

Canada has already raised a force of 220,000 men, of whom 120,000 have been sent abroad for service. The government now announces the intention to increase the force to 500,000, equivalent to raising a force of 6,250,000 men in the United States, being one-sixteenth of the total population. Everywhere in Canada the soldier is in evidence,—in camps of instruction in the summer, and in the cities in the winter, with training constantly going on.

The recruiting has not been uniform. Alberta has furnished double its quota, while Quebec has furnished only 9000 from a population of 2,000,000, about one-sixth of the quota due from that number. More than half of the recruits are of British birth. The *Toronto Globe* asserts that the great mass of the native born population between 20 and 30 years of age is still available for service. Married recruits are in the minority.

Canada has done more than merely furnish men. In addition to heavy contributions to the Red Cross and to the Patriotic Fund, Canada has subscribed \$100,000,000 to the war loan (\$12.50 per capita).

There is no rigorous press censorship, but the government has officially requested the press to make no unfriendly editorial comment on the course of the United States, a request that has not been observed absolutely.

It will be harder to raise the second 250,000 men than it was the first, though the work of recruiting began briskly and has continued steadily since the outbreak of the war. But the task now attempted will include half of the men of military age in Canada. Canada is content to do her share and let Great Britain run the war, so there is little criticism of British blunders.

["The West's Awake!" Canada in War Time. By Mary Sinon. *Scribner's Magazine*, Jan, '16. 4800 words. Illustrations.]

The west of Canada has furnished more than half of the 112,000 men that the Dominion has given the Allied armies. Western Canada has a population of 1,400,000, of whom 280,000 are men. One in three is an extraordinarily high ratio of eligibility; at this ratio, over 90,000 would have enlisted. The number is actually 65,000, or over two-thirds of the available men. In contrast with the west, Quebec, Montreal, Ottawa and Toronto have stood still. The failure of the French-Canadian element to enlist has caused no little comment. [This article gives, besides, some account of the effort made by western Canada to keep up the home standard, after the departure of the men, and sets out in detail the efforts of some of the western cities, notably Edmonton.]

[Methodical Enlistment. *The Canadian Military Gazette*, Jan 25, '16. 600 words.]

The Premier's authorization of an army of half a million men must not be taken as a direction that such an army be organized, and Parliament should consider carefully before enrolling so many men. Canada's population is relatively small, and it is doubtful if so many men could be spared without seriously affecting the food and ammunition supply.

This new force would require about a quarter of a million recruits. These could be raised and fairly well trained before the end of 1916, but great difficulty will be met in securing the necessary officers by that time.

[German-Canadians. By A. T. T., *The Canadian Military Gazette*, Feb 22, '16. 750 words.]

The present war has again proved that blood is thicker than water. The vast majority of German-Canadians, men of German parentage, born in Canada are loyal to Canada. But all of them are not. Therefore, it would be well to keep German-Canadians out of positions where they might do harm to the cause of the Allies.

The German population in Canada is small and the number of recruits from that source,

**CANADA—Continued**

even with every effort, will be negligible. They are thrifty and industrious and make good citizens. Therefore, why not let them alone? Let them produce while others do the fighting. In this way they cannot be placed in positions where they will be objects of suspicion, subject to temptation, and forced to spill the blood of their kin.

*See also*

PAY, ARMY—CANADA

—Army—Uniforms

*See*

UNIFORMS—CANADA

—Expeditionary Force for European War

[Note. *Information*, June, '16. Quoted.]

The Canadian Parliament ended its session May 18. The speech from the throne stated that nearly 170,000 Canadian troops had gone overseas and that more than 140,000 were undergoing training in Canada. To supply needed reinforcements, men had offered themselves in greater numbers during the first four months of 1916 than in any similar period during the war.

[Some More About Recruiting. By A. T. T. *The Canadian Military Gazette*, May 9, '16. 700 words.]

Despite the fact that the recent efforts in Canada to secure recruits have been unusually great, the number of men has been small. The volume of recruits is steadily decreasing. The quality, too, of these men is complained of. Some are too young, too old, or otherwise unfit for service, while still others can hardly be spared from the economic life of the country.

There is a shortage of men due to the fact that thousands are allowed to shirk their plain duty. The idle youths of the small towns and villages must make up this shortage. They have shown that they will not do it voluntarily, therefore they must be forced—and, after all, they will be the real gainers by the compulsion.

[Notes of the European War. *Army & Navy Jour.*, Sept 9, '16. 50 words.]

On Sept 6 Canada had 361,693 men under arms. Recent enlistments have been: May, 15,090; June, 10,796; July, 8675; August, 7246.

[What Canada Has Done. By W. R. Givens, Publisher and Editor *Kingston Daily Standard*. *Independent*, Oct 9, '16. 1800 words.]

Among the outstanding accomplishments of Canada in assisting Great Britain are: the expenditure of \$1,000,000 a day for war purposes; a casualty list of 30,000 killed, wounded, and missing; sending 33,000 men overseas within six weeks after the outbreak of the war, and a total of 250,000 to date; a total recruitment of 350,655 men out of 500,000 proposed to be raised; a total expenditure for war purposes of \$400,000,000 and \$100,000,000 more soon to be raised; manufacture of \$30,000,000 worth of munitions per month in 400 munition factories; establishment of numerous

training camps, one for 30,000 men (Camp Borden, Ontario); generous pension and separation allowance laws; private donations of \$30,000,000 for relief purposes; raising of \$50,000,000 a year in new taxes; establishment of hospitals; direct gifts to Great Britain (one of a million bags of flour).

The Province of Quebec has not done its share. With nearly one-third of the population of Canada, it has furnished only 36,890 men, of whom 10,000 were English-speaking residents. In other ways, her assistance has been pitifully small. The rest of Canada bitterly resents the shirking of Quebec.

*See also*

EUROPEAN WAR—LOSSES—CANADA

**CANALS**

*See*

SUEZ CANAL

CANNAR, Battle of

*See*

STRATEGY—Article: "CANNAR"

**CARS**

—Armored

*See*

AUTOMOBILES—ARMORED

RAILROADS—ARMORED CARS

—Railroad

*See*

RAILROADS—CARS

**CARTRIDGE CASES**

—Use of Steel for

[Steel Cartridge Cases. By Edward C. Crossman. *Scientific American*, May 6, '16. 3000 words.]

The coming of the solid-drawn brass cartridge case marked the real development of the breech-loading rifle. It is because of the importance of the little brass cartridge case that the British hope that copper shortage in Germany will prove one of the deciding factors of the war.

Brass cases, as now made, are mechanically perfect, but they have reached about the limit of the strength of brass, and rifle pressures are going up and up. Between the army rifle and the velocity of 4000 feet per second, with the resulting danger space of about 1000 yards over which the sights of the rifle need not be changed, there stand these obstacles: erosion of barrel steel through very high chamber pressure; metal fouling, caused by the friction of the cupro-nickel jackets on the steel of the barrel; flowing of the brass case under the high powder pressure. Improvements in powder by American makers and future improvements in steel will take care of the first; alteration of the composition of the bullet jacket, or some system of lubricant applied by means of the powder, will obviate the second; but the third can be taken care of only by the substitution of a different metal for brass.

Both from the standpoint of economy and of strength, a cartridge case of steel would be desirable, if we can make steel function through the draw presses with the facility of the brass cup. The economy may disappear



if the speed of the machine has to be cut down; if the wear on the tools becomes excessive; and if the reloading of the cases becomes impractical because of rust and corrosion through powder residue.

Some years ago there came reports of German and French experiments with steel for cartridge cases, and experiments have been made in the Canadian national rifle factory. Nearly a year ago, it was tried at Frankford arsenal. Experiments were conducted only far enough to determine the practicability of the process. Sample cases from Frankford are noticeably lighter than brass cases for the same rifle.

A protective coating of some sort to prevent rust would seem essential. The behavior of steel cartridge cases in rifles is still a matter of conjecture, but extraction should be easier, and there should be less chance for the occasional clean rupture of the case in the chamber of the machine-gun, leaving the forward part in the gun and putting that piece effectively out of commission until it is removed by a special tool.

One is led to wonder whether Germany has not found the process practicable, or whether her shortage of copper is not so great as it is reported to be. It is not at all improbable that the Germans have found practicable what the Frankford Arsenal has been able to do without much trouble. The Germans never yet have equaled the quality of the ammunition turned out from this government arsenal, and the Germans never have turned out powder equal to the latest product of the American du Pont Co., the progressive burning variety. Despite his painstaking thoroughness, it is not the Teuton alone who makes improvements in war material.

## CASUALTIES

See

WAR—CASUALTIES IN

## CAVALRY

[Note, for a rapid survey of the material under CAVALRY, that it is distributed on the pages indicated under the following geographical and subject subheads:

Holland, 87

Switzerland, 88

United States, 89

General Material, 87

—Arms—Saber, 89

—Combat—Use of Pistol in, 89

—Drill Regulations, 89

—Instruction and Training, 90

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—Scouting and Reconnaissance, 91

—Use of in Civil War (U. S.), 93

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—Tactics, 92

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Note also for much other valuable material on CAVALRY the cross-references, not only

after the General material under this head, but also after the material under many of the CAVALRY subheads.]

[The Present-day Requirements of the Cavalry. By C. J. G. L. Van Den Berg, of Sapa-roea, Captain of the Fourth Regiment of Hussars. *De Militaire Spectator*, No. 9, Sept, '15. 7400 words. 2 maps.]

(This article is to be continued in the next issue of *De Militaire Spectator* and abstract will be made when the article is published in full.)

[To the Cavalry Arm. By Teodoro de Iradier. *Revista de Caballeria*, June, '16.]

(Major Iradier, Editor of the *Revista de Caballeria*, in a farewell address to the Cavalry Arm, dwells upon the mission and work of the Review and gives a brief history of the publication from its inception in May, 1902, to May, 1916. Publication of the *Revista de Caballeria* closes with this issue. It will be succeeded by an official journal, *El Memorial de Caballeria*.)

See also

EQUITATION

HORSES

INFANTRY—MOUNTED

UNITED STATES—ARMY—CAVALRY

Holland

[Proposed Reorganization of the Cavalry. By F. G. deBas, Major of Hussars. *De Militaire Spectator*, No. 9, Sept, '15. 3000 words.]

The changes in the modern industrial world account for the remarkable decrease in the number of volunteers for service in the army. To maintain the forces at their full strength, it is necessary to depend largely on the militia. This is true not only in Holland, but in other European countries as well. There are altogether too many men of military age, physically and mentally sound, who do not sufficiently realize the duties and obligations of citizenship. For this reason we are glad to make mention of the measures recently adopted by the government, whereby in times of danger, all able-bodied Netherlanders of military age, after having received thorough training, are called upon not only to bring the active forces to the greatest possible strength, but also to provide the army with all that is needed, and to maintain a strong reserve.

The progress in military technique and the demands for a high state of efficiency concern especially the cavalry, and the very best training of horse and rider is essential if this branch of the service is to measure up to the standard of present-day requirements. From the yearly conscripts the strongest, brightest, and most promising men should be selected, and they should be assigned permanently to the field squadron. The efficiency of the field squadron has suffered greatly from the frequent and numerous withdrawals of men for service in other corps.

Again, the training of remounts requires a change in our methods. For this particular

**CAVALRY—Continued**

work the most capable, experienced riders, men who understand the art of riding, should be selected. This important work should not be entrusted to the militiaman, who has scarcely had a year of service and who has brought with him from civil life very little knowledge of the horse and very little experience in the art of riding.

*Switzerland*

[The Swiss Cavalry. Translation, apparently from *Rivista di Cavalleria*. *Jour. U. S. Cavy. Assn.*, Jan, '16. 7500 words.]

The article consists of a detailed description of the Swiss Cavalry. It is not susceptible of satisfactory abbreviation.

[The Swiss Cavalry. Translation from the *Rivista di Cavalleria*. *Revista Militar*, Jan, '16. 4000 words.]

The Swiss cavalry is composed of squadrons of dragoons and of guides, which, like the infantry, are recruited territorially by cantons and recruiting districts.

The squadrons of dragoons, the Elite, are grouped into eight regiments of three squadrons each, forming four brigades, and they are under the immediate command of a chief of cavalry.

The squadrons of guides are arranged in groups of two squadrons and they furnish the divisional cavalry and the detached cavalry for service with the various special arms.

There is a total of 54 squadrons of dragoons, 30 of the élite and 24 of the landwehr, with forty-two squadrons of guides, 30 of the élite and 12 of the landwehr. The army is divided into six divisions, and these formed into three army corps. Of the 30 squadrons of dragoons, 24 are brigaded, and it is probable that the remaining six are assigned to the three corps of the army, two to each.

Each squadron consists of one captain and four subalterns, six sergeants, ten corporals two or three farriers, and 117 or 118 privates. Each squadron has its own train, consisting of three wagons with four horses to each.

The squadrons of guides are stronger, having eight officers, 22 sergeants and corporals, and 124 or 125 privates, with 151 horses, three wagons and 12 draught horses. In the squadrons of guides, officers not commanding platoons will command patrols. The squadrons of landwehr are not mounted.

The organization of mounted machine-gun companies dates back to 1899. There are eight guns to the company, and the company is divided into four platoons with two guns to each platoon. In each company, a number of cavalymen are detailed for the service of security. Each company consists of seven officers, 22 sergeants and corporals, and 116 privates. There are 24 draught horses and seven wagons, four for ammunition.

Each Swiss citizen is required to render military service, and the course of instruction begins with the lowest grades in school. School children are divided into three classes: those under nine; those from nine to 12; and those over 12.

When the Swiss citizen reaches the age of 20, he is required to present himself to the levy of troops in the canton where he has his residence. Every citizen is subject to military service between the ages of 20 and 48, officers to the age of 52.

At the convocation of recruits, those desiring to enter the cavalry service signify this desire. They undergo medical examination to determine their physical fitness; this being determined, they undergo a mental examination to determine their standing and future possibilities for promotion. Certain conditions must be satisfied before the recruit is assigned to the cavalry, the requirements being purely physical.

Soldiers are furnished their equipment, arms, ammunition and rations during the time they are in actual service. After the mental examination for recruits, they are divided into three classes, according to the grades attained. Should a recruit show marked aptitude for the military service, his instructors note the fact on his record. The following year he may be instructed to attend the non-commissioned officers' school, and if, at the end of the school period he has been successful, he is appointed a corporal. The total time of instruction in the élite is, in the school of recruits, 90 days; then eight courses of instruction of 11 days each, making a total of 178 days' instruction in the élite. The course for non-commissioned officers is from 303 to 404 days, varying for the different grades. Colonel is the highest grade held by any officer in time of peace.

The officers have a school at which subalterns take 427 days and captains 635. Every non-commissioned officer in the Swiss army is a candidate for a commission.

The pay ranges from 15 cents a day in the case of a private to \$6 a day for colonel commanding a division.

Officers and non-commissioned officers as well as privates are required to maintain a mount for the military service, and these horses may be purchased from the Confederation. The government maintains a commission for the purchase of suitable mounts. This commission is composed of cavalry officers and a veterinarian whose duty it is to examine each horse purchased. Good horses are purchased, and they come from Germany and Ireland. In purchasing mounts, only the best are selected. The man who purchases a horse pays only one-half the purchase price, and he takes the horse home. Each year the soldier is paid 10 per cent. of the amount which he paid for the horse. At the end of the tenth year the soldier owns the horse, and he has received back the original amount paid for him.

The horse remains the property of the Confederation until the end of ten years, when it passes to the soldier, and he may employ it for any purpose that will not interfere with its military qualities. The horse may not be lent or rented or used by any other than the soldier to whom sold during the ten years that it is in the élite.

Such is the general outline of the cavalry organization of the Swiss Army, truly a militia army.

#### United States

[The Facts as to Our Cavalry. By Capt. H. S. Hawkins, 4th U. S. Cav., *Army & Navy Jour.* Apr 29, '16. 700 words.]

Two errors concerning our cavalry are discussed. The first is that our cavalry horses are unsuited to the work in Mexico. It is alleged that the Mexican pony would be better suited. But the larger and better type, well fed on oats and hay, is pre-eminently fitted for severe service. Even if oats and hay are missed occasionally, he will go farther and last longer than an inferior and ill-nourished horse. Neither a soldier nor a horse can be prepared for hard service by ill-feeding.

The wastage of horses in campaign is great. It has been so in the past and will be so in the future. This is merely a fact to be reckoned with.

The second error is the idea that cavalry is unsuited for campaigning in the mountains, whereas American cavalry is better suited for mountain warfare than any other arm of the service. No troops can go where cavalry cannot go. This has been proved in our Indian wars and in the Philippines.

Cavalry cannot, of course, replace infantry, but, provided with plenty of remounts, the American cavalry will perform its work and prove itself to be indispensable in any field.

[Recollections of an Old Cavalryman. By Lieut. Col. E. B. Fuller, U. S. A., Ret. *Jour. U. S. Cavy. Assn.*, Jan, '16. 6500 words.]

An interesting description of the many changes in the official and personal life of officers and enlisted men noted in the course of fifty years of cavalry service. Not susceptible of satisfactory abbreviation.

#### —Arms—Saber

[The Cavalry Saber. By Major C. D. Rhodes, U. S. Cavalry. *Jour. U. S. Cavalry Assn.* Apr, '16. 2000 words.]

(The Cavalry Equipment Board has received criticism of the present saber, principally with respect to the brittleness of the blade, the weight, the lack of balance, the straight blade, and the size of hilt. 2d Lieut. G. S. Patton, Jr., in a letter written to the Board at the latter's request, answers the above criticism and maintains that the present saber is an excellent weapon.)

#### —Combat—Use of Pistol in

See also

#### CAVALRY—TACTICS

(Article: "Cavalry Training")

#### —Drill Regulations

##### United States

[Revision of Cavalry Drill Regulations. Capt. LeR. Eltinge with remarks by Capt. S. Heintzelman. *Jour. U. S. Cavalry Assn.*, Apr, '16. 1200 words.]

The Board revising the Cavalry Drill Regulations should have the assistance of sugges-

tions from officers of the cavalry service. The following is advanced as presenting points of our old drill that need attention:

1. There is included no system of fire control, fire direction, etc.

2. As our squadron can seldom put on the firing line more rifles than a large European company does, our squadron, as a fire unit, should be handled like such a company—the major to assign targets, etc. At any rate, the duties of each commander with reference to fire should be definitely laid down, not left to guess or chance.

3. Any system of fire control requires a system of signals to carry it out. For the sake of uniformity, the infantry system should be accepted by us.

4. The cavalry, more than any other arm, needs a quick, easy and thoroughly understood method of visual signalling. Existing systems are not wholly suitable for all purposes. Considerable experiment will probably be necessary to determine the best system. Patrols must be able to communicate with each other and to the rear, the elements of outguards and of a screen must be able to keep up communication. What are we to have for this purpose?

5. For drill purposes, we should have words of command, trumpet or whistle signals, and visual signals. All should be practised, none used to the exclusion of any other. In war all will be called for at different times.

6. There should be a single uniform method of dismounting to fight on foot, applicable to all formations and to all parts. The following is preferred (explained only for the troop).

At the command, or signal: To FIGHT ON FOOT, all numbers one and three dismount rapidly and form in line in single rank, behind the captain, facing in the same direction as the latter. The captain, at the command, dismounts at once and moves in the direction toward which he wishes the firing line to face, the reins of the captain's horse being taken by his trumpeter. The even numbers, remaining mounted, seize the reins of the horses of the odd numbers. The commander of the rear platoon remains mounted, marches the led horses to a place of safety, has the horses linked in fours, uses such numbers two as are needed as guard for the led horses and as patrols to insure their safety, and brings forward the remaining numbers two as support. The latter will arrive soon enough to reinforce the firing line, to extend it, or to be assigned a different target. The captain may cause more men to be brought forward by calling to the commander of the rear platoon: LINK BY PLATOONS, or LINK BY TWOS, HEAD AND TAIL.

Capt. Heintzelman's notes on the above:

The new regulations should consist of three parts, preferably bound separately. Part I should contain what pertains to the course of instruction and the formal drill. Part II should contain combat principles. Part III should contain ceremonies, calls, information as to the care of horses and equipment, etc.

**CAVALRY—Continued**

Parts I and III would necessarily be subject to frequent amendments. Part II, enunciating, on broad lines, the principles of cavalry combat, should be changed rarely and then only after serious consideration. The determining factor in cavalry tactics is the mission, naturally divided into offensive and defensive. The discussion should involve, for each of the two main divisions first cited, the following subdivisions, corresponding to varying conditions:

1. When the cavalry force involved is supplemented by no special fire unit (e.g., a machine gun unit).

2. When the cavalry force involves a special fire unit (e.g., machine gun troop, horse battery or cyclists). To fail to employ properly such a unit would be to fail to exert one's full strength.

3. When the force of cavalry is not the main arm involved in the action, but has its methods of employment more or less restricted due to its status as an auxiliary arm that is assisting in obtaining a tactical decision.

Mission and the composition of forces are the elemental factors that determine tactics.

In Part I there should be separate rules for the technical handling of cavalry in the charge and in the fire fight, the latter closely assimilated to the infantry. In Part II there should be combat principles which, interpreted in the light of each particular case, will determine the mounted, dismounted or combined action which will best accord with the mission, utilize mobility, and adapt itself to the terrain.

**—Equipment**

[Cavalry Equipment. By Maj. C. D. Rhodes, U. S. Cavalry. *Jour. U. S. Cavalry Assn.*, Apr, '16. 1400 words.]

(A detailed and technical article regarding cavalry equipment, and the lines along which the Cavalry Equipment Board is conducting its experiments and tests. Not generally susceptible of satisfactory abbreviation. The Board expects to recommend: a "McClellan saddle with a French seat"; a canteen and mess kit similar to the Preston kit; the present bridle; steel stirrups for the use of officers in garrison, leather hooded stirrups for all other uses; the slinging of the rifle on the trooper's back. Experiments are being made with a halter made of lariat rope with parts connected by one piece castings of metal without buckles. Efforts are being made to improve the temper and balance of the saber. Experiments are being made with the Kerr adjustable stirrup straps, which dispense with buckles and permit of quick adjustment from the saddle by an easy pull on the strap.)

See also

**SADDLES****—Equipment—Saddles**

[Note. *Army and Navy Jour.*, Feb 19, '16. 200 words.]

The Cavalry Equipment Board may re-adopt the McClellan saddle. Experiment has failed to develop anything superior. The jointed side-bars, designed to prevent sore backs, have been a disappointment, and the

seat is not comfortable. The French saddle, splendid for fancy riding, is reported by observers to be a disappointment. They have seen nothing better than the McClellan saddle.

**—Instruction and Training**

[Some Dismounted Work of Cavalry. By De Rosey C. Cabell, Lt.-Col. 10th Cav. *Army & Navy Jour.*, Dec 11, '15. 1300 words.]

Although all is not known of the work of the cavalry in the European war, there is, in the popular mind, an increasing conviction that cavalry has played a minor, if not an insignificant, part.

If the European cavalry has failed, the failure is due to its training. The training of the American cavalry is quite different from the European, and it is certain that our cavalry would give an excellent account of itself in a war such as is being fought in Europe. The training of the American cavalry in dismounted action is not, however, as efficiently conducted as it should be. American cavalry officers should study carefully the general principles of infantry fighting.

[Training of the Cavalryman. *Rev. del Circulo Militar*, Sept, '15. 2400 words.]

Fencing is the best exercise to give flexibility and elasticity to the joints and muscles. Also, if practiced regularly, it is splendid exercise for the lungs.

Training on foot is also necessary. Above all it is necessary to learn to march. A gait is taken that does not extend the legs, the body inclined forward so as to advance the center of gravity. This is the gait that the hunter takes instinctively when the chase is long and difficult.

In preparing the horse for long marches, three principal points require attention: (1) Putting him in condition properly speaking; (2) nutrition; (3) regulation and changing of gaits.

To put the horse in condition, work him continuously and slowly 6 to 7 hours a day; the muscles harden more and more, the appetite increases incredibly. Trotting strengthens the posterior muscles, the gallop exercises the kidneys and the lungs without fatiguing the joints or the tendons. Any exercise that affects various parts of the body is good. It should always be arranged in a progressive manner.

[Training of First Cavalry Brigade. *Army & Navy Jour.*, May 6, '16. 800 words.]

The system of training has been: 1st, Progressive garrison training and field instruction as laid down in orders from brigade headquarters; 2d, The training of troops on schedules submitted in advance by the troop commanders; 3d, Semi-annual inspection and test of instruction by the brigade commander.

In the semi-annual inspections, tests of all classes of field training were imposed, with special emphasis on fire efficiency and dismounted action. Combat exercises were conducted by the Brigade Commander.

[Cavalry Questions. By Major Eiriz. *Re-*

*vista Militar* (Argentina), Mar, '16. 2000 words.]

*Squadron (troop) inspection.*

On the day designated by the regimental orders for the inspection, the squadron is formed under arms in line in field equipment, but in dress uniform.

The inspector requires the following movements:

To pass in review.

To break from line into column of troopers and to move in a circle at the different gaits.

Individual pointing with the lance at dummies.

Twenty-five minutes' close and extended order drill by commands, calls and signals at the different gaits.

A charge and simulated mêlée, followed by a rally and another charge.

Simple formations and exercises to test the ability of the squadron to maneuver without reforming after the rally.

To reform the squadron and to demonstrate the use of its fire action dismounted (this gives the horses a rest).

To pass obstacles with the entire squadron (jumps should be easy).

After a rest, a "march past," the regimental band leading. A critique is then held.

The regimental officers should attend the inspection and critique. The inspection should include tests in reconnaissance work; the services of security while on the march and in camp; passage of water courses; escort of convoys; independent missions of all kinds; demolitions and crippling of railroad, telegraph, and telephone lines, etc.

The inspection of rifle practice should be confined to an examination of the squadron records. The frequent visits of the regimental commander to the target range are sufficient properly to inform him as to the proficiency of the organization.

At the close the inspector makes a careful inspection of the horses to determine their fitness for field service.

[Cavalry Instruction. By Maj. Alonzo Gray, 14th Cavalry. *Jour. U. S. Cavalry Assn.*, Apr, '16. 1200 words.]

The cavalry will have to give more attention to the collective use of the rifle. In addition to the control of the firing line, we must adopt methods of bringing effective fire on distant targets and of so distributing this fire that we can maintain a fire superiority during an advance.

(The article describes the use of the horizontal and vertical clock faces to identify targets; discusses the use of the mil scale in this connection; and gives a detailed set of hand signals proposed for use on the firing line.)

[Command in the Cavalry and the School of Fire. By Oga. *Revista de Caballeria*, Apr, '16. 1200 words.]

A cavalry commander can be guilty of no greater fault than that of inaction. He must be able in a few moments to make a decision, to issue the corresponding orders, and

to put them into effect. He must have energy, physical vigor, tactical ability, and clear mental processes. He must also be willing to sacrifice personal interest for that of the state.

For the general good, it is recommended that colonels of cavalry be detailed for instruction at the Central School of Fire.

In Apr, 1914, 32 colonels of cavalry attended the German Central School of Fire. In May and June of the same year, there were two courses of instruction, the total attendance aggregating 80 colonels and lieutenant-colonels of infantry and engineers.

[The Cavalry School of Fire. Inauguration of the Complementary Course for Second Lieutenants of the Active List, Year 1916. *Revista de Caballeria* (Spain), May, '16. 14,000 words.]

The addresses of Captain-General the Marques of Tenerife (General Weyler), General Ricardo Arana and Major Angel Dolla at the opening of the course at the Cavalry School of Fire are given.

Major Dolla's theme is "Cavalry in Modern War." He contrasts the present rôle of cavalry with that of the past century, calls attention to the criticisms which have been directed against cavalry since the Boer War, replies to these in defense of the arm, and dwells at length upon the use of cavalry in the European War. In conclusion, he points out the mission of the School of Fire and gives the general plan of the course. His address is of particular interest in that he quotes freely from a German General Staff article entitled "The Operations of the German Cavalry to the East of Wilna." This cavalry, which consisted of a corps of three divisions, operating with the left wing of the Army of the Niemen on the advance towards Dunaburg in Sept, 1915, seems habitually to have brought into use every class of action of which cavalry is capable. An assault with the bayonet and the capture of a fortified position are mentioned. The German article quoted from is illuminating as to the capabilities of cavalry in modern warfare.

—Scouting and Reconnaissance

[The Geology of Reconnaissance by the Cavalry. By Oga. *Revista de Caballeria*, June, '16. 1100 words.]

It is hardly expected that officers should be geologists, but there are certain facts and peculiarities about the structure of the earth's surface that, being of military interest, should be studied and understood. A few observations will show the importance of this knowledge to the officers of reconnoitering cavalry.

The continued action of water upon feldspar results in the formation of clay. In rainy weather clay forms a mud which makes the roads impassable. Water in clayey soils is not potable as a rule. The sense of smell enables one to discover clayey ground at certain distances, and to avoid this with all its disadvantages. Roads through a granite country are not easily destroyed. The sand acts

**CAVALRY—Continued**

as a filter so that streams usually furnish good drinking water.

In calcareous soil roads are not permanent and waters are not potable.

Alluvial soils are shifting and of bad quality for roads.

A knowledge of the soil gives by deduction the strength of the trenches, fortified works, buildings, etc., since the material used in the construction of these generally comes from the same place, or near by. This information is obviously of great value to artillery officers.

See also

TACTICS—INSTRUCTION AND TRAINING—  
MAP PROBLEMS—CAVALRY PATROLS

**—Service Regulations**

See also

CAVALRY—DRILL REGULATIONS

**—Tactics**

[Cavalry Training. Exercises required by orders from Hdqrs. First Cavalry Brigade, Brig. Gen. James Parker Com'dg. *Jour U. S. Cavalry Assn.*, Apr, '16. 3000 words.]

Combat Exercise No. 10. *The pursuit of a cavalry rear guard by a mounted force.* The troops are divided into two equal forces; one, the cavalry rear guard (blue); the other, the pursuing cavalry (red). The rear of the retreating main body, which the rear guard protects, is represented by wagons moving two miles per hour. The main body is supposed to include infantry, artillery and a train. The route of the retreating force is a road, or trail, selected in advance and known to both sides. With the advance guard, as well as with the rear guard, is a battery, platoon or section of artillery, or men with flags to simulate the same. The action is supposed to take place in a defile; limits of action, one mile on each side of road. The conditions are such that neither commander is justified in scattering his command. The depth of the retreating column is such that it is not possible for the pursuing force to pass it and head it off. The maximum distance between the rear guard and the wagons is limited to one mile. The rôle of the Reds is to halt, cut off, capture or destroy the Blues or to attack the retreating Blue main force. The rôle of the Blues is to protect the retreat of the Blue main force, inflicting such damage as possible on the Reds. They should keep in touch with the Blue main body. The exercise begins with the Reds and Blues in contact by means of scouts, the Blue force in position. (There follow detailed directions and suggestions as to the procedure to be followed in carrying out the above exercise.)

Combat Exercise, No. 11. *The mounted attack of cavalry against an outlined or represented enemy.* The terrain selected for this exercise should admit of free movement, but afford frequent cover. If the latter be not available, it should be simulated. The exercise may be practised by a force of cavalry ranging in size from two troops to a regiment or brigade. In preparation for this exercise the horses should be so trained that,

when moving at an extended gallop, they can be pulled up within 30 yards.

The gaits employed in the advance to the attack should be the trot, gallop and extended gallop. In the attack itself, to prevent dangerous collisions, the gait should not be faster than the extended gallop. To accustom the horses to the exercise, it would be well to practise it first at the trot. (Detailed directions and suggestions for carrying out the exercise follow.)

Combat Exercise, No. 12. *Mounted attack of a position.* This exercise is conducted with a view to illustrate the procedure when a cavalry attacking force advances at full speed, in extended order, over a fire swept space, dismounting and attacking on foot when the hostile position is reached. The advantages of the method are based upon the rapidity of the advance; the fact that the enemy must fire on a moving target; and the fact that hand-to-hand fighting will follow the arrival of the attacking force. This form of attack was successfully used in the Boer War in South Africa. One trooper in each four acts as horse-holder and seizes the reins of the other three troopers when the latter dismount. Successive lines of foragers follow at about 300 yards distance, all dismounting on or near the line where the first group dismounted.

Combat Exercise, No. 13. *The use of the pistol against an outlined or represented enemy.* The pistol is a weapon for open order work. The saber must be used for the shock attack delivered by men riding boot to boot. Three forms of pistol attack are described and discussed: (a) the *swarm attack*, where the troopers approach the close formations of the enemy, then turn and ride ahead of, and in the same direction as the enemy, firing to the rear at the latter; (b) the *encircling attack*, where the troopers ride around the close formation of the enemy, firing into the hostile ranks; (c) the *direct attack*, where the troopers charge the enemy's lines or columns and ride through them. The details of each attack and some of the applications are brought out, also the fact that the rifle can similarly be used mounted.

**—Use of in Balkan Wars**

[The Cavalry in the Two Balkan Wars. By Major Aurelio Richetti. *Rivista di Cavalleria*, Dec, '15. 7000 words. Continuation from a preceding number.]

**The Cavalry in Macedonia**

Much anxiety existed in the minds of the Serbian commanders concerning the fighting qualities of their army, raised to seven times its peace strength by the addition of reservists. Accordingly, the first movements were made with great prudence, and the cavalry, instead of being sent on distant exploration in front, was kept with the infantry.

Mobilization was ordered Sept 30 and was completed Oct 7. The cavalry was expanded from a peace footing of 16 squadrons to a war footing of about 45 squadrons. Forces of from one to four squadrons were assigned to the divisions of the four Serbian armies.

The failure to make use of the cavalry left the Serbian forces without information of the enemy. It also prevented proper communication between different columns of the same army. The result was that on the night before the battle of Kumanovo, the Serbian armies were badly scattered, one of them being 60 km. from the battlefield. The Turks made better use of their cavalry and had information of the position of the greater part of the Serbian forces.

#### *The Battle of Kumanovo*

On the first day of the battle the Serbians were hampered by the absence of their artillery, which was delayed by bad roads. The action was begun by the 1st Danube Division, using its cavalry on its left. On the evening of the first day it was joined by the Cavalry Division. The next morning two squadrons were sent out on reconnaissance, but the pressure of the Turkish forces on the left became so heavy that the cavalry had to abandon its mission of exploration in order to cover the threatened flank. In the afternoon the Turks brought up a mountain battery which inflicted heavy losses on the Serbian cavalry. The situation was critical. A battalion of infantry and a squadron of cavalry with machine-guns were sent against the battery, but were repulsed. The general in command considered the possibility of arresting the Turks by a charge of the Cavalry Division, which had not been engaged, but this plan was abandoned because the Turkish infantry was unshaken and even stimulated by its success, and the ground over which the charge would have to be made was effectively covered by infantry and artillery fire, and in addition was so softened by rains that the horses would be mired. Fortunately, the Turks did not press their advantage, and in the evening the Serbian forces withdrew and took up a defensive position. The Turks renewed the attack during the night, but without success, and the next day three additional Serbian divisions reached the field and the Turks were driven back.

The Turks were now in full retreat over the entire front, but the Serbians did not recognize the extent of their own success, due to failure to make proper use of cavalry. The Serbian cavalry was lacking in spirit and seemed content to follow the enemy rather than pursue him. The Serbian general headquarters was too far from the scene of action and too poorly connected with it to grasp the situation. Vigorous pursuit would have disclosed the extent of the enemy's demoralization, and would have prevented him from accomplishing the reorganization of his forces that made it necessary to fight another battle at Monastir.

#### *The Passage of the Babuna Mountains*

The Turks crossed the Vardar River five days after the battle of Kumanovo and decided to make a fresh stand in the vicinity of Monastir, where the ground was favorable for resistance. The mountainous nature of the country rendered the task of the Serbian

cavalry much more difficult than it had been in the early stages of the retreat. But the spirit of the cavalry had changed; it had become more energetic and self-reliant and its action was notably successful. Its patrols observed the movements of the enemy and prevented surprise, while the larger bodies of cavalry guarded the flanks of the infantry. An example of the energy and enthusiasm of the cavalry was shown at Gostivar, where a cavalry brigade and a horse battery, pursuing a Turkish corps, overtook the rear guard and defeated it with heavy loss.

#### *—Use of in Civil War (U. S.)*

[The Rôle of Cavalry. Comment by Col. Eben Swift, G. S., on a confidential dispatch from Gen. R. E. Lee to the President of the Confederate States, dated July 5, 1864. *Jour. U. S. Conv. Assn.*, Jan., '16. 300 words.]

The comment draws attention to the soundness of General Lee's apprehension, expressed nine months before his surrender, that the superior strength of the United States Cavalry would largely determine the issue of the campaign in Virginia.

#### *—Use of in European War*

[Chronicle of Cavalry Actions in the War of the Nations. By Major Eugenio Massa. *Rivista di Cavalleria*, Nov., '15. 6000 words.]

(This is a daily record of the activities of cavalry. A few condensed extracts are given here.)

*Nov. 1, 1914.* To the south of Ypres a village strongly held by German infantry and artillery was captured by French cavalry attacking on foot with lances in their hands.

*Nov. 3.* Bodies of African and Indian troops passed along the Hazebrouck-Merville road on the way to join the Allied armies opposing the German attack on Ypres. Among them were Spahis mounted on Arabian horses of the finest breed, Sikhs, Gurkas, Afridis, and Pathans, armed with long sabers and short rifles, mounted on Australian horses and crossed Indian and English breeds.

*Nov. 4.* In the western theater continual rains, freezing winds, and snow in the mountains rendered the cavalry inactive. The systems of trenches adopted by both belligerents are reducing the operations to an artillery duel.

*Nov. 6.* To the northeast of Ypres a squadron of French Hussars, wishing to dislodge a German squadron from a village, sent into the village a small platoon of drunken horses ridden by straw figures enveloped in cloaks. While the attention of the Germans was occupied with this body, the French squadron fell upon them and inflicted heavy losses.

*Nov. 7.* The German emperor reviewed and addressed the troops in a Belgian city, saying: "I am glad to hear that the cavalry is fighting well. Some tasks have fallen to the cavalry that I did not expect, and it is perhaps my fault that the cavalry has not been instructed in peace in the duties that it now meets. The cavalry has fought with saber, bayonet and pick, and General Mauwitz tells me that the infantry has been willing and

**CAVALRY—Continued**

proud to advance to the assault with the cavalry."

*Nov. 15.* Some Russian dragoon regiments, the advance guard of strong columns advancing in East Prussia and Poland, were stopped and driven back by German forces operating offensively on both banks of the Vistula. The Russians lost 23,000 prisoners.

*Nov. 16.* A large mass of German cavalry, taken partly from the western theater, was reinforced by the Austrian cavalry that had been covering the German concentration against the Russian army in Poland, and the combined force moved forward.

*Nov. 28.* A French squadron of dragoons made a night attack on a German aviation park on the Soissons-Compiègne road and destroyed the aeroplanes and a convoy of automobiles. The attack was made at 2:30 a. m. with two platoons on foot and one mounted. The mounted platoon charged the machine guns protecting the park, while the platoons on foot destroyed the aeroplanes, breaking up the motors and firing the gasoline tanks. A stout resistance was made by the Germans and only about 40 of the French escaped unhurt.

**Month of December**

On account of the weather, operations during December in France and Belgium consisted of a struggle in trenches, where cavalry had no part. The Germans took advantage of this opportunity to concentrate cavalry for future operations, such as those of Hindenburg in Poland. The Allies appeared to fall in with the Germans plans, making no serious efforts on the western front, except an occasional bayonet attack upon some pieces of trench. Sapping, mining and bombardment were carried on, but without any great practical results.

For these reasons, it is useless to attempt to make a record from day to day of the operations of the cavalry.

[The Uhlans and Other Cavalry in the European War. By Lieut. Col. J. S. Barrows, I. G., Mass. V. M. *Jour. U. S. Cavalry Assn.*, Jan, '16. 2000 words.]

Although a systematic effort appears to have been made in recent years to minimize the importance of cavalry, and even to claim that the arm is obsolete, careful reading of the European dispatches will show that cavalry has been effectively used in all the armies. The trench warfare into which the operations of the armies in the western theater have largely resolved themselves are, of course, not conducive to mounted action; but even here the Uhlans were used most effectively by the Germans in their initial dash on Paris in their important task of securing the widest possible sphere of intelligence. The development of the Uhlans began in Poland when, in 1717, the Polish Army was reorganized. Later Austria, Russia, Prussia, France, Belgium and Great Britain all added Uhlans or "Lancers" to their cavalry establishments.

(Various instances of the use of Uhlans and other cavalry in the European War follow, with the following summary.)

The use of the cavalry continues—in such formations and dispositions as may best fit the need and the occasion. No formal formation seems to have been preferred. The cavalry attacked in masses, charging artillery and using the saber; it was used in raids, it charged and fought other cavalry mounted; it was dismounted and did good work in the trenches; it made sudden dashes at small scattered forces of infantry, dispersing and bothering them in their plans.

[Conditions of Modern War. Cavalry Pursuit. By General Bonnal (reprint from the French). *Revista de Caballeria*, June, '16. 1200 words.]

The German offensive against Verdun has been definitely checked since March 20th. The check to the enemy causes us to think of taking the offensive with a view to breaching the western line and in this way returning to a war of movements.

In proof that the offensive spirit has always been present with the French is cited a semi-official article which appeared in the morning papers of March 3d, before the attack against Verdun had been broken up. This article referred to French superiority in cavalry and to its advantageous use in the hour of victory in pursuing the defeated enemy.

The organization, instruction, and fighting efficiency of our cavalry has been perfected. It is armed with a bayonet and fights on foot with the potency of infantry. In mounted action it is superb. Thanks to purchases made abroad it is well provided with mounts.

Because of the blockade, Germany has been unable to furnish remounts for her cavalry which is now inferior to ours.

In her cavalry France has a reserve force whose weight will be felt intensely when the moment arrives to *exploit the victory*.

[Chronicle of Cavalry Actions in the War of the Nations. (Continuation.) *Revista de Caballeria*, June, '16. 1600 words.]

(This is a chronological record of cavalry actions in the European war on both the western and eastern fronts. It will be continued in the *Memorial de Caballeria*.)

See also

CAVALRY—INSTRUCTION AND TRAINING

(Article: "The Cavalry School of Fire")

MARNE, BATTLE OF THE

(Article: "Cavalry in the Battle of the Marne.")

—Use of in Russo-Turkish War

[The Use of Cavalry in the Campaign of 1877-1878 on the Western Front. By P. Bashenov. *Voenny Sbornik*, May, '16. 3600 words.]

This account deals with operations occurring after the first of Aug. 1877. At this time it was the custom of the Russians to insert batteries of artillery between the two halves of each regiment of cavalry, both in the advance guard and in the main body of cavalry com-



mands. This appears to have been done to assure to the cavalry a sufficient power of fire.

The article gives a detailed account of the movements of the cavalry division of General Lashharov from Aug 17th to Aug 22nd in the general neighborhood of Plevna. Nothing of importance occurred, the account being mainly the recital of patrol and reconnoitering parties. The one exception was the capture on the 22nd of a Turkish convoy of some 500 wagons returning from Plevna.

[Cavalry in War. By Bashenev. *Voenny Sbornik*, June, 1916. 3800 words (continued from May, 1916).]

(This article gives a detailed account of the operations of the Russian cavalry in the Russo-Turkish war from Aug 23, 1877, to Aug 24. The account is based on numerous documents which are referred to; but the value of which is unknown to the translator. Movements of individual squadrons are described, and the orders and information under which they acted are given. The work appears to be very thorough, but is not of much interest except to a student of the particular phase of the campaign treated of.)

## CEMENT

[Engineering Notes. Technical Study of the Modern Methods of Manufacturing Portland Cement. By Capt. C. Serrano, Professor at the Academia de Artilleria. *Mem. de Artilleria* (Spain), Jan, '16. 8000 words (continued). 1 table.]

(This is a detailed description of Portland cement, the raw materials for its manufacture, the influence of the various elements on its properties, etc. Many data are given)

[Engineering Notes (continued). By C. Serrano, Capt. and Prof. at the Artillery Academy. *Mem. de Artilleria* (Spain). Feb, '16. 14,000 words. 12 figs.]

(Portland Cement Making. This is given in detail with a wealth of illustration.)

[Engineering Notes (concluded). By C. Serrano, Capt. and Prof. at the Artillery Academy. *Mem. de Artilleria* (Spain), Mar, '16. 10,000 words. 3 figures.]

(Cement making. Various types of furnaces. Chemical principles involved. The above article as a whole appears to be an excellent and detailed presentation of the subject.)

## CENSORSHIP (of the Press)

See

PRESS CENSORSHIP

## CHAMPAGNE, Battle of

[The Battle of Champagne. Sept, 1916. Notes from a French Official Publication. *Revista Militar* (Argentina), Mar, '16. 1300 words. 3 illustrations and 1 map.]

The front attacked extended from Manonvillers to the Valley of the Aisne above Servon. The first line (German) consisted of from two to five trenches echeloned over a depth of from 300 to 500 meters, with complete accessory de-

fenses. There were impenetrable entanglements, deep bomb-proofs, and supporting points armed with machine guns.

The network of entrenchments formed veritable labyrinths, which had received characteristic names. The Germans had a second very strongly fortified line on the heights from 3 to 4 kilometers to the rear; the terrain between the lines was prepared for serious resistance.

The French batteries bombarded the German positions for three days with their most modern guns in action. They were enabled to judge the fire effect by the condition of the captured trenches. In some places the ground was completely leveled, shelters filled up and the entanglements destroyed. The fire was delivered over the entire first line, while the heavy guns bombarded the roads, railroads and stations to the rear; as a result of this certain lines of supply were cut, and a number of German units were without supplies for 48 hours.

The clear atmosphere on the 22d and 23d of Sept permitted good observation of the fire. The 24th was cloudy, but the clouds were so high that the aviators could continue their work. On the morning of the 25th, the clouds were low and at 9:00 a. m. it began to rain. The assault started at 9:15 a. m., over a front of 25 kilometers.

At three points the advance was particularly rapid. Towards the Wood of Souain, the French attacked divergently in three columns, near the Mill of Souain, they captured the works of the "Palatinat" and "Magdeburg," penetrated the entrenchments "von Kluck" and "von Tirpitz," and assaulted the fortification "William II" at a distance of two kilometers from the starting point.

In the center, in less than an hour, the French had taken the road Souain-Somme-Py, and had arrived in front of the farm of Navarin.

On the east, the African troops captured the German first line at a bound and moving against the Souain-Tahure road, captured the military railroad and some magazines.

To the right of the Africans, the troops at once captured the salient called "the pocket," and soon attained a distance of more than one kilometer from the starting point. By midday, they had passed the road Souain-Tahure and had arrived on the slopes of Hill 193, advancing 4 kilometers.

To the north of Beauséjour, the French captured a fortified system of not less than five successive lines in a depth of 400 meters, and occupied the road from Perthes to Cernay as far as Maisons-de-Champagne.

On the eastern front the Colonial infantry, thanks to the destructive power of the artillery, were enabled to take the "hand" of Massiges.

On the afternoon of Sept 25th, the French lines were so sinuous that some units faced east and others west. On the 26th and 27th the French consolidated the positions taken and established their lines facing north in contact with the German 2d line over a front

**CHAMPAGNE, Battle of—Continued**

of 12 kilometers. About 40 square kilometers of ground was retaken.

[The Battle of Champagne. By Lieut-Col. E. E. Vinuesa, P., Military Attaché to France from Ecuador, *Revista Militar del Estado Mayor General*, Quito, June, '16. 12,000 words and map.]

(Editor's Note: This excellent and well-written article is Colonel Vinuesa's official military report of the fighting in the Champagne sector, which sector he was allowed to visit and study.)

**I. TERRAIN**

After the Marne the Germans prepared a strong line of defensive positions extending from the hills of Manonvillers on the west to the Argonne on the east. The object of this line was to cover the Challerange-Bazancourt railroad. The front of the line of attack, which extended from Auberive to Ville-sur-Tourbe, naturally divides itself into six distinct sectors which were, from west to east, L'Epine de Vedegrange, Souain, Perthes, Mesnil, Beauséjour and Massiges. The heights north of Massiges resembling roughly the shape of a human hand were, on account of their location, the key point to the eastern flank of the line. Therefore, it was carefully prepared with extensive defensive positions and covered with obstacles.

An examination of the system of defense adopted by the Germans shows that there were in general two distinct positions about a mile apart, the first being the denser. Everywhere for a distance of from 300 to 400 meters, there were at least 3 and sometimes 5, parallel lines of trenches. In some places the trenches were separated by entanglements from 15 to 60 meters wide.

The second position consisted of a single trench reinforced in some places by a supporting trench. These trenches were constructed behind the crest of the hill. On the military crest were the observation posts and covers for machine guns. These latter were connected with the trenches by a system of ditches. The ground between the two positions was also carefully prepared for defense. The artillery positions, as well as the camps and stores were located behind the first position.

The French were thoroly informed of all these details and, before the attack, had prepared accurate maps of the various sectors in which every trench, ditch, obstacle, wood, etc., was given a name or number. The attack began on Sept 25 and by Oct 3 the French had accomplished the following: they had occupied the slope of L'Epine de Vedegrange, and also the heights overlooking the valley of Souain, had entered the pass north of Perthes as far as Hill 193 and Tahure, had taken the strongholds west of Mesnil, had advanced as far as La Maison de Champagne and taken by assault the heights of Massiges, a total gain of 40 square kilometers.

**II. ARTILLERY PREPARATION**

The French began their bombardment Sept 22 and kept it up night and day until the 25th, endeavoring to accomplish the following:

1. Destruction of obstacles and entanglements.
2. Burying the defenders in their underground covers.
3. Destruction of the trenches and embrasures.
4. Obstruction of the connecting trenches.

This fire covered the entire position, while the longer range pieces bombarded German Headquarters, camps and railroad stations, trying thus to prevent the arrival of reinforcements and supplies.

Letters found on German prisoners show that in all of the above efforts the French met with a high degree of success.

**III. THE ASSAULTS**

At the hour fixed for the assault on the Champagne front (9:15 a. m., Sept 26) the French infantry climbed rapidly out of their trenches on specially prepared ladders, and aligning themselves for an instant on the parapet, launched the attack. The distance covered in the assault averaged about 200 meters. This was covered without great losses because the Germans were surprised. The French entered the first line trenches at the same time, but after that the progress was not uniform due to the German machine guns and the more stubborn resistance met with in certain places. This makes the assault hard to follow. Therefore, the entire battle of Champagne should be considered as a series of assaults executed at the same time along parallel or converging lines. The development of the battle will be considered separately in each of the sectors named above. The French offensive could accomplish nothing on the flanks of the line of attack, due to the heavy converging fire and strong counter-attacks of the enemy.

**L'EPINE DE VEDEGRANGE SECTOR**

To the west of the St. Hilaire-St. Souplet line the French flanked the first German line and after an assault of about one kilometer were halted before the entanglements in front of a supporting trench. A counter attack coming from the west and aided by the artillery caused the French left to fall back a little. The right flank, however, fared better and not only held the points they had gained, but in a few days made contact with the troops attacking from the east. The triumph of these troops was all the greater because of the thousands of difficulties which they encountered. The German position consisted of 3 (some places 4) lines of trenches, protected machine-gun emplacements, fortified woods, etc., the whole being protected by the artillery in the rear. The taking of the first position lasted several hours and it was not until about 5 p. m. that the French found themselves in front of the second position. This they penetrated in two places the following day, capturing several trenches. The attack on the west was stopped at the Parallél du Bois Chevron.

To the east the French captured 400 meters of trenches, but these could not be held on account of the concentrated fire from the German heavy artillery. The general results in this sector were the capture of 15 sq. kilometers of territory well prepared thruout for defense, 44 guns and more than 3000 prisoners.

#### SOUAIN SECTOR

In this sector the German line formed a great curve about Souain and it was difficult for the French to get within assaulting distance of the position. The assault was finally made in three different directions: on the west, towards the woods of Hills 167 and 174; in the center, parallel to the Souain-Somme line and towards Navarin. On the east, towards the woods which cross the Souain-Tahure line and towards La Butte de Souain.

One interesting feature of the assault was the rapidity with which the advance was made; on the left, 2 kilometers in less than an hour; in the center, 3 kilometers in 45 minutes. At 10 a. m. the French were on the heights of Navarin Farm. On the east the advance was slower, due to the German machine guns at Bois Sabot. These positions were finally enveloped. On Sept 27, these troops were able to join with those attacking from the north of Perthes. After taking the first position and capturing several batteries and a great supply of stores the French, on Sept 28, found themselves in contact with the entire second position.

#### PERTHES SECTOR

Between Souain and Perthes there is a mountainous region 1500 meters wide and 4000 meters deep. This had been the scene of heavy fighting in February and March. This fact, together with the German defenses in the woods of Trou Bricot, made it hard for the French advance from that direction. The French plan in this sector was to envelop the woods of Trou Bricot.

East of Trou Bricot the terrain was not so difficult. The plan was to attack in both of these directions at once. The attack was begun, and at 9:45 the Poche salient was in the hands of the French. Thruout the day the results were generally favorable for the French and at nightfall one of their regiments had reached the Souain-Tahure line. The night was uneventful and the next day at dawn the French renewed the attack and succeeded in establishing themselves in direct contact with the second German line from La Butte de Souain to La Butte de Tahure.

#### MESNIL SECTOR

In this sector the French met with the greatest resistance from the enemy. The German trenches were invisible and undamaged by artillery fire and protected by the two heights of Mamelles and by the Butte du Mesnil.

On Sept 25, to the east, a few French units succeeded in penetrating the trenches near Mesnil, but were later driven out by a counter attack.

#### BEAUSEJOUR SECTOR

The French attacks to the north of Beausejour met with quick and brilliant results. The assaulting lines fell on the successive German positions (woods) and took them in the following order: Bois en Fer, Bois de Lance and Bois en Demi-Lune. The left wing, however, on account of the obstacles in its path had difficulty in keeping up the advance. In order to draw the German artillery fire from the advancing French infantry 2 squadrons charged the guns. This diversion allowed the infantry to carry forward the attack, capture the trenches and take more than 600 prisoners. During the whole of the afternoon of Sept 26, the Germans made counter attacks in the region of Rippont, but were unable to dislodge the French from the crest of Maison de Champagne.

#### MASSIGES SECTOR

With the taking of the heights of Massiges the French advance as far as Bois Allonge and Maison de Champagne was assured. The Germans considered these positions impregnable. At 9:15 a. m. the two first attacking groups moved forward in line of skirmishers with one pace intervals, and at 9:30 were in possession of the plateau. From there on the progress was very slow. The infantry continued to advance, however, fighting with bombs and hand grenades and assisted by the artillery with which it communicated by flags. From Massiges there was established a continuous file of men for the passage forward, from hand to hand, of bombs and grenades. As fast as a new supply arrived the French advanced, taking many prisoners in each advance. This same kind of fighting continued until Oct 3, the Germans continually sending reinforcements, but failing in all of their counter attacks. The possession of the ground around Massiges permitted the French to extend their line toward Ville-sur-Tourbe, taking from the flank those positions which had successfully resisted a frontal attack.

It is interesting to note that the German General Staff at first denied the loss of Massiges and later claimed to have withdrawn from it on account of overwhelming artillery fire, but never admitted the facts of the hand grenades and bomb fighting.

#### IV. THE ATTITUDE OF THE ENEMY

The attitude of the Germans was characterized by:

1. Surprise.
2. Confusion.
3. The hurried and disorderly deployment of the reserves.
4. The inability properly to prepare a general counter-offensive.
5. Demoralization of the soldiers.

#### V. THE RESULTS

1. Ferme Navarin Region
  - (a) Taking of the parallel of Bois Chevron.
  - (b) Capture of a part of the Vandales trenches.
  - (c) Capture of the Kultur trench.

**CHAMPAGNE, Battle of—Continued**

2. Tahure Region.
  - (a) Capture of Butte Tahure.
  - (b) Taking the village of Tahure.
  - (c) Taking the Brosse à Dents trenches.
3. Mesnil Region.
  - (a) Capture of Mamelles.
  - (b) Capture of Trapèze (Oct 8).

In closing his report Colonel Vinuesa compares the spirit of the French and German armies as displayed in the Battle of Champagne, and therefrom draws a very valuable lesson. He says: "The German officer allows himself to be killed as a result of his military spirit, the French officer, on account of his patriotism. The latter is the finer spirit, but every country is not France. Let us, therefore, so educate the military spirit of our officers that they may achieve with our troops that discipline which will ever be the bulwark of the government and the guarantee of public order."

[The French Offensive in Champagne, Sept, 1915. From the data of the French General Staff. Communicated by Col. Echagüe and Lt.-Col. Benítez. *La Guerra y su Preparación*, May, '16. 4500 words. Illustrations; maps (aeroplane).]

(This is substantially the report published in the DIGEST ANNUAL, pps. 96-97 above.)

**CHILE****—Army—Artillery**

See

FIELD ARTILLERY—INSTRUCTION AND TRAINING—CHILE

MACHINE GUN—TROOPS—ORGANIZATION—CHILE

MOUNTAIN ARTILLERY—FIRING REGULATIONS—CHILE

**—Army—Infantry**

See also

INFANTRY—INSTRUCTION AND TRAINING—CHILE

**—Army—Organization**

[Revision of the Military Organic Law, to Conform with the Modern Organization of the Army. By Captain Arturo Carvajal A, *Mem. del Ejército* (Chile), May, '16. 4650 words.]

A critical study of the present organic law reveals the fact that it is unconstitutional, antiquated, badly arranged, and that a good many of its provisions are covered in the regulations which have been issued from time to time.

A commission should be appointed to make a study of the German articles of war, and to draw up a military code to conform with the local conditions of our Army.

[The Organization of the Chilean Army During the War of 1879-1884. By Lieutenant-Colonel F. J. Díaz. *Mem. Del Ejército* (Chile), July, '16. 5000 words, exclusive of roster of Division, Brigade, and Regimental Commanders.]

A comparative study of the war in the light of the present teachings and based on these

fundamental principles:

1. Organization of a recruiting service, in peace and war time, based on compulsory service and producing a fighting mass that may be estimated from 5 to 10 per cent. of the entire population.
2. Assignment of this fighting mass to proper branches of the service and corresponding organizations, due regard being paid to tactical and strategical requirements.
3. Assignment of the higher commanders, and organization of the service of supply.
4. The carrying out of the mobilization plans, or in other words, changing the army from a peace to a war footing.

**—Coast Defense**

[Our Military Ports. By Alberto Sierralta, Capt. Art. *Memorial del Ejército de Chile*, Dec, '15. 1000 words.]

Almost no advance has been made since the time of President Balmaceda, 1888-1889. We have only a few guns of 28 centimeters in the ports of Valparaíso and Talcahuano. Lately an officer of the Coast Artillery of the United States has made experts of some of our officers of the Army and Navy at the School for Coast Artillery.

The ports with the old material, modernized, new aiming devices, and a system of fire control are in a perfect state of repair. They are, however, useless when compared to their natural enemy—the modern dreadnought—for example, our port Arica, the natural base of operation of our squadron in the north, and in the richest part of the country, has one fort with guns of insufficient caliber. The same is true of the ports of Valparaíso and Talcahuano. Of the latter, it is peculiarly true that it could not resist an attack of a squadron which had 12 inch guns, because its guns have a very reduced radius of action. It lacks at least 5 forts, not to mention the lack of mobile troops, communication between batteries and electric lights. From this can be seen the lack of national defense in our country, and the need of a permanent and selected coast artillery corps.

**—History**

See also

CHILEAN-PERUVIAN WAR

SARMIENTO, DON DOMINGO FAUSTINO

**—Military Topography of**

[Preparation of a General Map of the Country. By Major P. Charpin. *Mem. del Ejército* (Chile), May, '16. 1300 words.]

There is no doubt that a map of the country is a military necessity of the utmost importance. The foremost countries in Europe, through their General Staffs, have devoted special attention to the preparation of military maps, and keeping them up to date. Advantage has been taken of all modern improvements in instruments, methods, etc., in order to reach perfection in the development of such maps. Chile has followed this example, and will be the first American nation to possess a military map of the country.

The army needs a thorough topographical and geographical knowledge of the

country. It is better prepared to undertake the compilation of a general map. The Army has as many working centers as there are regiments or units, and stationed from Tacna to Punta Arenas. Each of these units has a nucleus of officers who are proficient in map making and sketching. There is no military operation which does not require a map or a sketch of some sort. Therefore, if the army needs the maps, if its members who are trained in this work are scattered throughout the territory of the Republic, it is evident that the completion of such maps is only a question of time.

The War Department has ordered the mapping of a 40-kilometer zone surrounding each garrison. These local maps can be used as the framework of the general map, to be enlarged later through tactical and staff rides, division maneuvers, and experimental trips for motor transportation.

The maps of the boundary commission, hydrographic charts, maps of railroads in operation or projected ones, and the General Staff maps can be utilized in carrying the work to completion.

The law punishes false information. A map which is not a faithful representation of the corresponding ground is a false document. Therefore, it is necessary to warn all officers as to the importance of this kind of information, and of the responsibilities they may incur.

#### CHILEAN-PERUVIAN WAR

[La Concepción. By Lieutenant-Colonel Luis A. Cabrera. *Mem. del Ejército* (Chile), Aug, '15. 950 words.]

A historical sketch of the Chilean-Peruvian war describing the heroic defense of the Concepción barracks by 77 men of the 4th company of the 5th Chacabuco Regiment of the Line against 1800 Peruvians.

The engagement commenced at 2.30 p. m., July 9th, 1882, and lasted until 9.30 a. m., July 10th. When the enemy captured the place, not one of the defenders was alive.

#### CHINA

—History

See also

FAR EASTERN QUESTION

JAPAN—History

(Article: "Japanese Policy in China.")

#### CHLORINE

See also

ASPHYXIATING GASES

#### CIVIL DUTIES

—Use of Army for

See

ARMY—USE OF FOR CIVIL DUTIES

#### CIVIL WAR, U. S.

See also

CAVALRY—USE OF IN CIVIL WAR (U. S.)

—Engineering—Field Operations

See also

FORT DONELSON, CAPTURE OF

MINES—USE OF IN CIVIL WAR (U. S.)

RIVER CROSSINGS—IN CIVIL WAR (U. S.)

—Military Lessons of the

[Some Aspects of Great Campaigns—The Great Civil War. By Capt. R. G. Cherry, R. F. A. *Jour. Royal Artillery*, Mar, '16. 6000 words.]

The invasion of Virginia by the Federal Armies in 1862 has so many interesting and instructive features that a single essay, dealing with all its varying aspects would not completely cover it. It may be divided into three periods.

The first period was mainly taken up with Jackson's campaign in the Shenandoah and has already been covered. The second period covers the main theater of operations near Richmond.

#### Diary of Events

Apr 2, 1862.—McClellan landed with 58,000 at Fort Monroe.

Apr 5-May 3.—McClellan held up by Magruder with 10,000 at Yorktown.

May 5.—Battle of Williamsburg.

May 11.—Destruction of Confederate iron-clad *Merrimac*.

May 6-12.—McClellan advanced on Richmond, forming a new base at White House.

May 24.—McClellan sent Porter with 25,000 to north bank of the Chickahominy.

May 31-June 1.—Indecisive battles of Seven Pines and Fair Oaks.

June 12.—Start of Confederate cavalry raid around Federal lines.

June 17.—Jackson arrived at Ashland Station.

June 26.—Beginning of Confederate offensive—Battle of Mechanicsville.

June 27.—Battle of Gaines' Mill.

June 28.—McClellan transfers base from White House to Harrison's Landing on the James.

June 29.—Battle of Savage's Station.

June 30.—Battle of Glendale.

July 1.—Battle of Malvern Hill.

July 2.—Federals occupied and fortified Evelington Heights.

Aug 20.—McClellan re-embarked.

#### Political Interference

The question of political interference may well be considered here because of its disastrous effect on the strategy of the campaign. War, being an offshoot of politics, is made and ended by the politicians, and the general who is about to undertake a campaign must plan with due regard to the political situation and submit his plan to the government for approval. Once approved, the state should not interfere with its execution unless found to run counter to national policy, and even then interference should not deprive the commander of his means for attaining success.

McClellan's plan of campaign was good; the troops were supplied by sea; the objective, Richmond, was close to the base; and the constant and close menace to their capital should deter the Confederates from offensive measures. But it had one grave defect in that it left Washington insecure in the opinion of President Lincoln and his advisers. On his side, McClellan made no attempt to allay their

**CIVIL WAR, U. S.—Continued**

uneasiness. The President's action in dividing the Federal forces into five separate commands, thus depriving them of unity of control, was unwise military policy; likewise his repeated withdrawals of McDowell's corps, as it deprived McClellan of what he considered a necessary reinforcement, paralyzed his initiative, and made his movements slow and undecided. The Confederate commanders likewise were not free from political interference, in spite of the fact that President Davis had some knowledge of war.

*The Personal Element*

In all great campaigns, the personality of commanders is a factor the importance of which can hardly be overestimated. The mark of a great general is his ability to appraise correctly the character of his opponent, and to make from this study good inferences as to the opponent's probable actions. The American Civil War is full of examples of the importance of character study and consideration of the personal element. In this campaign Lee felt justified in taking risks, knowing McClellan's over-caution and McDowell's slowness.

*Command of the Sea*

Perhaps the most valuable asset to the Federals in this whole war was the command of the sea. In this campaign it made possible McClellan's invasion of the Yorktown Peninsula by sea, and compelled the Confederates to evacuate their fortified position at Centerville. The fleet was able to secure the landing at Fort Monroe, guard the communications with Washington, and ensure the safe arrival of reinforcements for the Army. The evacuation of Yorktown and the destruction of the *Merrimac* gave the Federals a base extending from end to end of the peninsula, ensuring the safety of the Army and its supplies when its communications with White House were cut by the defeat of Porter at Gaines' Mill.

*The Offensive Spirit*

While the interference of Lincoln and the superior strategy of Lee and Jackson contributed to the failure of the Peninsula Campaign, yet a study of the operations indicates that had the commander-in-chief acted throughout in the true offensive spirit, success would have been secured. McClellan seems to have been a man who, though possessing great military knowledge and personal magnetism, yet was unable to divine correctly the intentions and plans of his enemy. As a result, he made his own plans to suit imaginary conditions. A still more fatal weakness lay in his inability to retain the initiative. In his advance from Fort Monroe, he expected to find Yorktown the only obstacle, and ordered his army to advance and begin the investment at once. Subsequent reconnaissance revealed the Confederates entrenched along the line of the Warwick River; at this time he received word

of the retention, for the defense of Washington, of McDowell's corps which he had planned to send against Gloucester. He brought up his siege matériel, and started to besiege Yorktown, apparently having made no methodical reconnaissance of the Confederate lines and ascertained their weak points and the weakness of the defending force.

The withdrawal of the Confederates from Yorktown was followed up leisurely, and no attempt was made to keep pressure on them. The battle of Williamsburg was fought without plan or cohesion on the part of the Federals, and McClellan did not arrive on the field until the action was nearly over.

The destruction of the *Merrimac* gave McClellan two alternatives: he might transport his army to City Point and after occupying Petersburg, then undefended, advance on Richmond from the south; or, he might cross the Chickahominy with part of the army, which would be based upon White House, and extend a hand to McDowell who was preparing to move south from Fredericksburg. The latter was the plan adopted. The success of the plan depended upon McClellan's retaining the initiative. But his advance was slow and deliberate, and Jackson's successes in the Valley alarmed Washington, McDowell was ordered to suspend his march south and detach a strong force to the Valley. McClellan's position was perilous, as he had transferred 25,000 men under Porter to the north bank of the Chickahominy to join hands with McDowell, and each part of the army now was liable to be defeated in detail. Between May 24 and 31, he might have transferred Porter to the south bank, established a new base at Harrison's Landing, and attacked the lines before Richmond with some chance of success. He made no move, and was in this position when attacked at Seven Pines. During the three weeks following Seven Pines he still had opportunity of attacking with every chance of success, but the approach of Jackson from the Valley made him apprehensive for his own safety, and the initiative passed to the Confederates. The great object lesson of this campaign is that superior numbers are of no avail unless the force, from the commander downward, is animated by the offensive spirit.

*Co-operation and Mutual Support*

From the end of May until the conclusion of the campaign, the initiative passed to the Confederates, whose two attempts to crush the invading army resulted in failure because of neglect of the vital principle of mutual support.

The offensive operations against McClellan may be divided into three periods: Johnston's attack on the Federal left at Seven Pines; the enveloping movement of Lee and Jackson north of the Chickahominy; and Lee's pursuit of McClellan to Harrison's Landing. In all these operations the Confederate plans involved the co-operation of subordinate commanders who failed.

At Seven Pines, Johnston planned to crush that part of McClellan's army south of the Chickahominy and issued verbal orders to

Longstreet who was charged with the conduct of the attack. The verbal orders were misunderstood by Longstreet, who was de-attack until 1:00 p. m. on the 31st, and then attacked with but part of his forces. McClellan in consequence and did not begin the plan was able to reinforce with some of his troops from the north bank. On June 1st Huger attacked, but was not supported, and his attack was soon brought to a standstill.

At Mechanicsville, Lee's plans involved co-operation of A. P. Hill and Jackson north of the Chickahominy in the attempt to crush Porter's corps. Jackson was delayed, and troops assigned by Lee to maintain connection between the two columns failed to do so. Hill attacked alone and was repulsed. The Federals withdrew to a strong position at Gaines' Mill and here Lee, by threatening the line of communications with Jackson's force, hoped to cause Porter to weaken his left. But McClellan already had abandoned his base at White House, so Jackson's movement caused no dismay. Jackson's march was delayed by skirmishers and obstructed roads, so that Hill's unsupported attack against Porter's right, and a final effort of the whole Confederate line finally broke the Federal center. Reinforcements enabled Porter to retire to the south bank.

In the operations south of the Chickahominy, the same lack of co-operation among the Confederate columns is evident. On the 29th, Magruder was to delay the Federal rearguard, while Longstreet and A. P. Hill recrossed the Chickahominy and struck the Federal rear, and Jackson crossed at Grapevine Bridge and struck their right. Jackson found Grapevine Bridge destroyed and took the entire day to repair it; Magruder attacked the Federal rearguard at Savage's Station and was repulsed; the other columns advanced slowly and did not gain touch with the enemy. McClellan's forces then took up a defensive position about Glendale and Fraser's Farm. Lee's plan once more depended upon intimate co-operation in a difficult country. Longstreet, supported by A. P. Hill, was to attack and hold the Federals until Jackson could cross at White Oak Swamp and take them in their right flank and rear. Huger was to co-operate on Longstreet's left, and Magruder and Holmes were to intercept the retreat to Malvern Hill. Lee's arrangements did not ensure that the attack at Glendale, the decisive attack, should be made with the largest possible force, since he concentrated there only Longstreet and Hill, and they did not make their attack simultaneously. Huger was delayed by felled trees, Magruder was diverted too far to the south, and Jackson was held up at White Oak Swamp and took no part in the battle. As a result, the Federals held on until nightfall and withdrew to Malvern Hill during the night. Lee attacked there next day, but was repulsed and the operations ended with McClellan's withdrawal to Harrison's Landing.

The great lesson of this latter portion of the campaign is that in order to obtain full suc-

cess, "careful preparation and skillful direction" in all movements is essential, and the best conceived plans are apt to fail if co-operation and mutual support are not ensured.

## CLUBS

See

INFANTRY—ARMS—CLUBS

## COAST ARTILLERY

[Note, for a rapid survey of the material under COAST ARTILLERY, that it is distributed on the pages indicated under the following geographical and subject subheads:

- Fire, 101
- Fire Control, 101
- Instruction and Training, 102
- Instruction and Training—In Schools and Colleges, 102
- Instruction and Training—War Game, 103
- Matériel, 103
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- Organization, 104
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- Range Finding—Instruction and Training, 104
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- Range Finding—Clothing Board, 105
- Range Finding—Predictor, 105
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Note also for much other valuable material on COAST ARTILLERY the cross-references, not only after the General material under this head, but also after the material under many of the COAST ARTILLERY subheads.]

See also

COAST DEFENCE—BY MOBILE GUNS  
GERMANY—COAST DEFENSE

## —Fire

[Diagrams of Fire. By José Augusto dos Santos Lucas, Capt. of Art. *Revista de Artilharia*, Jan, '16. 2000 words. To be continued.]

A technical study, with mathematical demonstrations reduced to graphical form, based on spherical co-ordinates, giving the results of the author's experience while commanding a sea-coast battery. This first instalment is devoted to the general theory of the scheme, and is to be followed by the application thereof.

## —Fire Control

[A Firing Signal Visualizer for Mortar Batteries. By Electrician Sergeant Lyon P. Vane, C. A. C. *Jour. U. S. Artill.*, Jan-Feb, '16. 1200 words. 1 diag.]

The firing signal visualizer was devised as an aid to the battery commander to enable him to remember, during drill, which pit has signalled ready to fire. Thus he is free to devote his attention to other details of the drill and does not have to take an enlisted man from other duties to keep this information for him as is often done.

The system has been tested with success in the Coast Defenses of Portland, Me., and may be improvised at any post at a cost of about five dollars for material.

**COAST ARTILLERY—Continued**

It consists, for each pit, of a lamp connected to automatic electric relays which close and open the lamp circuit. The circuit closing relay is connected in parallel with the bell circuit in the firing station; and the circuit opening relay, in series with the bell in the pit. When the pit signals are ready to fire, its signal lamp lights and remains lighted until the signal to fire is given, or in case of a relay until the lamp circuit is opened by hand.

For complete description and wiring diagram, see complete article.

**—Instruction and Training**

[Training of Reserve Officers of the Swedish Coast Artillery. By Capt. Gustaf Wennerström. *Kustartilleritidskrift*, part 4, '15. 2200 words.]

By the law of 1914, relating to the army, the important change in the regulations was made that reserve officers for the navy and the coast artillery should be organized separately and that also, since there is not time to train the coast artillery officers for both artillery and mine service, they are to begin their training, as candidates for officers, for either the artillery or the mine service.

Hereafter those who have had their first service of 458 days as conscripts and have taken the so-called student examination for the artillery and sea captain's examination for the mine service will be accepted as candidates for officers in these two services, provided they fulfill the other requirements.

The age limit is 24 years for the artillery and 27 for the mine service. The reason for the difference in age limit is the greater requirements in a sea captain's examination in the navigation schools.

Besides the above mentioned class of persons, corporals of the regular service may also be accepted as candidates. This is more apt to apply to corporals of the mine service.

Applications are made to the chief of the coast artillery who acts upon them after the usual examination.

After being accepted, the candidate receives the rank of corporal and is promoted after a certain amount of satisfactory training to non-commissioned officer of the first grade in the reserve.

After a completed satisfactory training the candidate is recommended by the chief of the coast artillery to the king and commissioned as *ensign* in the coast artillery reserve.

After having become an officer it is necessary for the one assigned to the artillery service to have a "repetition" training of 45 days every third year until he becomes 45 years old. To be entitled to promotion to a captaincy he must take more training than the above prescribed under special regulations.

For the mine service the conditions are somewhat different, since a sailor's business would be very much interfered with if he had to have a course of training every third year; therefore, in place of a training every third year a candidate appointed as *ensign* shall immediately serve with the coast artil-

lery mine service for one year. If this officer wishes to be promoted captain he must take a "repetition" training of six months in one of the 6 to 10 years after his appointment as *ensign*. On the recommendation of the Chief of Coast Artillery an *ensign* who has served two years and has had satisfactory training, etc., is promoted sub-lieutenant, and for the *artillery service* from sub-lieutenant to lieutenant one who as an officer has had 3 trainings. From lieutenant to captain one who as officer has had 10 trainings.

For the *mine service* from sub-lieutenant to lieutenant, one who has been an officer at least 8 years, and from lieutenant to captain one who has been an officer at least 18 years, and has had the prescribed training. Officers in the reserve must not be promoted before officers in the regular service who entered the same year.

A "candidate" is entitled to receive while undergoing training for the artillery service the same support and privileges that a conscript has during his service and also 300 kr. (\$80) for clothing. For mine service he is entitled to receive 3½ kr. (about 94 cts.) pay per day, 300 kr. (\$80) for clothing and free medical care as well as in certain cases an allowance for mess.

They are also entitled to receive from the government stores certain articles to replace those worn out or damaged, and also necessary traveling expenses.

The officer training for the *artillery service* is entitled, while in actual service, to the same pay and allowances as a regular officer of the same grade and corps. A captain of the reserve is like a regular captain of the 2d class, with the exception that he does not receive an allowance for quarters.

In *mine service* the officer of the reserve receives the same pay and allowances as the corresponding grade in the regular establishment, and as his service lasts 6 months he also receives quarters or allowance for same.

All officers receive 200 kr. (about \$53) for clothing on being appointed *ensign* and also necessary traveling allowances.

On attaining the age of 45 a reserve officer is discharged and, if honorably discharged, is entitled after attaining 55 years, for the rest of his life, to a yearly pension of 300 kr.

An officer who has been retired with full retired pay, in case of war or preparation for it, may be called on for active service up to the age of 65, while an officer of the reserve who has been discharged at 45 is no longer obliged to render more service.

See also

COAST ARTILLERY—TARGET PRACTICE

—Instruction and Training—In Schools and Colleges

*United States*

[Non-Commissioned Officers' Schools. By 1st Lieut. Walter J. Buttgenbach, C. A. C. *Jour. U. S. Artill.*, Jan-Feb, '16. 3200 words.]

The Coast Artillery Instruction Order, 1916, gives in general terms the subjects to be covered during the infantry and field instruc-



tion of Coast Artillery troops. Nothing is specified in this order as to the instruction of non-commissioned officers, but when we begin to attack the problem we find as many methods as there are coast defense commands, or even companies. Progress in any scheme of instruction or in methods of training can not be satisfactory until we have a certain standardization.

The problem is practically the same in all companies since the recruits all come from the same sources and the average intelligence of the men of all companies is about the same.

Promotion to all non-commissioned grades in the company should be by selection from two eligible lists; one, of privates for corporal, and the other of corporals for sergeant. Eligibility for these lists should be obtained only by successfully completing standard courses for privates and corporals, respectively. Attendance upon the privates' course should be voluntary as far as practicable, but all corporals should be required to take the corporals' course.

The following advantages would be gained by this method:

1. A uniformly instructed set of non-commissioned officers, irrespective of company.
2. A standard of qualification for promotion.
3. Elimination of non-commissioned officers unwilling to qualify for advancement.
4. An incentive for non-commissioned officers' schools.

(A syllabus of the courses proposed and of the text-books suggested for use is given in appendices to the complete article.)

[Cadet Artillerists. By 2d Lieut. Fred M. Green, C. A. C. *Jour. U. S. Artill.*, Mar-Apr, '16. 2500 words.]

In war with any important power, we may expect that the coast artillery will be the first branch to become engaged. In recognition of the long time required to build batteries, the government has been generous in the construction of matériel.

No such enormous increase in our regular forces ever will be granted as will enable us to man all the batteries, therefore we ask for half, depending upon the militia to man the rest. This hope has not been realized, and in time of war we must expect a large proportion of volunteers. The time available for training volunteers will be short, and the task will be difficult even if regular lieutenants be assigned to command batteries manned by the volunteers. To accomplish results in the short training period that will be available, even regular officers must have the assistance of competent instructors. The deficiency of our regular companies must not be undermined by detaching their best non-commissioned officers at the outbreak of war. What we need most is a class of men available for rated positions in volunteer companies in time of war, and capable of acting as assistant instructors to other recruits.

It is proposed to obtain these men from engineering students at land-grant colleges, who by reason of their mechanical experience and

mathematical training are peculiarly fitted for coast artillery service. At present only infantry instruction is given in the great majority of such colleges.

It is suggested that a broad scheme of coast artillery instruction be started at some land-grant engineering college situated within easy reach of some coast artillery militia armory, where position finding equipment and dummy guns are available. The course should be elective as an alternative to infantry instruction, and only those students possessing natural ability and evidencing a genuine interest should be allowed to pursue the course. The course should be laid out with the aim of training first in the general system and then in the duties of rated positions and the position finding system. No attempt should be made to develop a tactical unit, and at first the size of the class should be limited. Thus would be secured a valuable reserve for the coast artillery service.

(Appended is a syllabus of a suggested division of time among the various subjects of instruction, including a basic course, and courses for gun commanders, observers, and plotters.)

See also

#### COAST ARTILLERY—TARGET PRACTICE

##### —Instruction and Training—War Game

[Coast Artillery War Game of the State of New York. By Lieut.-Col. W. Irving Taylor, C. A. C., N. Y. *Jour. U. S. Artill.*, Mar-Apr, '16. 1000 words. Illus.]

The area of Coast Defense of Long Island Sound was selected as the terrain for this war game, for the reason that it is there that the New York companies hold their annual target practice. Construction began Mar 1, 1914, but the installation has only recently been completed.

Several novel features are contained in the installation, among them being small motors and controllers for traversing the searchlights electrically; variable resistances in the searchlight lamp circuits, by which the intensity of the lights can be varied to simulate atmospheric conditions; and border lights of various colors, controlled by dimmers, to give a variety of light effects simulating dawn, night, noon, etc.

##### —Matériel

#### United States

[Sixteen-Inch Coast Defense Gun for Panama. *Scientific American*, Dec 25, '15. 500 words. Illustration.]

(NOTE.—Calls attention to the fact that there have been built in the U. S. only two 16-inch guns—one for the army and one for the navy. The army gun was completed and tested some ten years ago. The gun has been slightly modified and is now at Sandy Hook, where it will be tested on a disappearing carriage, and then sent to Panama.)

##### —Matériel—Disappearing Guns

[Coast Artillery Gun Carriages. By N. C., *The Military Historian and Economist*, July, '16. 1500 words.]

The disappearing gun carriage now used in our service is a complicated machine, bulky, expensive, immobile and not used by any other nation. In addition, it is mounted in open, extensive and costly emplacements, whose size and shape make them easy to locate.

The heavy ordnance being now used in Europe is as follows: Germany, a 42 cm. Krupp howitzer; Austria, a 30.5 cm. Skoda howitzer; Great Britain, 15-inch howitzer with a 1400 lb. projectile. All of these are mobile and susceptible of rapid mounting, dismounting and transportation. We use the disappearing carriage for calibers of 6, 8, 10, 12 and 14 inches, and also place on immobile mounts smaller guns. We are, therefore, at present far behind other nations in the development of heavy, mobile ordnance. There is no reason why we should fasten our guns to concrete bases, while other countries have developed mobile carriages for guns of the same size.

Our fortifications, armed with immobile artillery, have probably been mapped, but these maps would be of no use to an enemy if the location of our guns could be changed. Further, it is impossible to conceal our open emplacements from aeroplane observation, and they are very vulnerable to bomb attack. The main point is, however, that with mobile guns we could meet the enemy no matter where he tried to land.

It seems that we have been on the wrong track in the development of our coast defenses and it is hoped that the Ordnance Department will not be restricted in its effort to develop a newer, better and more up-to-date type.

#### —Matériel—Repairs to

[A Method of Removing the Cross-head from a 6-inch Gun Disappearing Carriage, Model 1903. By Lieut. Lee R. Watrous, Jr., Coast Artillery Corps. *Jour. U. S. Artill.*, Nov-Dec, '15. 300 words.]

Some of the teeth on the cross-head racks of the guns at Battery Zook, Fort Wetherill, R. I., having been broken, it was necessary to remove the cross-heads in order to put in new racks.

The gun was raised from the trunnions sufficiently to permit the cross-head to be drawn from the guideways. The methods employed and the tools and material used are described fully.

#### —Organization

##### United States

[Note. *Army & Navy Jour.*, July 1, '16. 150 words.]

Under the new law there are no coast artillery companies, but a flexible organization is provided so that the strength of the detachment can be varied to suit the particular gun served. The organizations will be tentative.

#### —Range Finding

[Diagrams of Fire. By Jose Augusto dos Santos Lucas, Capt. of Artillery. *Revista de Artilharia*, Feb, '16. 1000 words and 1 table. To be continued.]

(A continuation of the article in the January number, being a mathematical calculation, reduced to a table or diagram, for finding the angle of convergence at different ranges, or a "difference chart.")

#### —Range Finding—Angular Travel Rule

[A Circular-Angular Travel Rule. By 2d Lieut. Charles M. Frost, Coast Artillery Corps, National Guard of California. *Jour. U. S. Artill.*, Nov-Dec, '15. 300 words. 1 illus.]

This device is for the purpose of determining the travel of the target in azimuth during the observing interval. The material is cardboard, with a brass center and a brass pointer.

For description of the construction and operation of the rule, reference should be had to the complete article.

[Angular Travel Reference Number Computer. By 1st Lieut. Roy R. Lyon, C. A. C. *Jour. U. S. Artill.*, Jan-Feb, '16. 1000 words. Illus.]

The object of this device is to determine the angular travel reference number, for use at the deflection board for guns, from azimuth observations taken by a position finder or other angle-measuring instrument at the battery, and do away with the necessity of taking this information from the plotting board.

It is made of cardboard or celluloid and can be improvised readily. It consists of but three parts, a pointer and two circular discs, all secured at the center by an adjustable screw. The instrument is simple in construction, compact, and admits of continuous operation, giving the reference number after each observation.

For description and method of operation, see complete article.

[Angular Travel Board. (Furnished for publication by the Office of the Chief of Coast Artillery.) *Jour. U. S. Artill.*, Mar-Apr, '16. 500 words. Illus.]

At batteries where the secondary station is located in the battery commander's station in the center of the battery, the travel of a target in azimuth is the same when measured by the secondary instrument and the gun arm. With that in mind, this board was first suggested by the plotter, Sergt. Lester Y. Epperson, 10th Co. C. A. C., as a rapid and accurate means of getting travel for use on the deflection board. The travel board is operated by No. 1, and does away with the tally-dials, eliminating the varying travels they give. It also saves the plotter from taking time necessary to set on the plotted points.

(The illustrations are an essential part of the description.)

#### —Range Finding—Instruction and Training

See also

COAST ARTILLERY—TARGET PRACTICE

#### —Range Finding—Instruments

[Coast Artillery Range Finders. By J. Maldonado, Commandant of Artillery. *Mem. de Artilleria* (Spain), Jan, '16. 11,000 words. 4 tables.]

The best types of existing range finders are fundamentally of two classes—vertical or horizontal base. The range finders with a long horizontal base require two stations, at the extremities of the base, and are said to be *long base*, but there exist other instruments, also of horizontal base, which require but one operator and these are known as monostatic, instantaneous, or short-base instruments.

Instruments of either type may be external to the battery or situated with one station in it. If they are external, it is necessary to reduce the measured distance to the battery and to communicate it in some manner to the captain; the first increases errors, the second complicates the organization, loses time, and slows up the shooting.

We shall study, therefore, only apparatus *internal* to the battery. (Here follows a discussion, based on assumed formulae for the probable errors, as a result of which it is decided that the vertical base type is most suitable on account of its comparative accuracy and the simplicity of the installation required.)

#### —Range Finding—Plotting Board

[A Short Method for Testing the Accuracy of a Plotting Board. By Capt. Charles B. Gatewood, Ordnance Department. *Jour. U. S. Artill.*, Nov-Dec, '15. 750 words. 3 diags.]

A method is described for testing the accuracy of a plotting board, whenever specially calculated data for testing purposes are not at hand or when such data are of doubtful accuracy. The method is of use primarily only to an inspector of ordnance material.

For full details reference should be had to the complete article.

[Semi-Automatic and Universal Plotting and Relocating Board. By Major Harold E. Cloke, C. A. C. *Jour. U. S. Artill.*, Mar-Apr, '16. 3000 words. Illus.]

The fundamental principle of this board is the same as in all plotting boards; i.e., the solution of a triangle knowing two sides and the included angle. The principle of the board reverses the old method, in that the target is located at the pivot and not at the intersection of the primary and secondary arms.

The board is semi-circular in form, and has at the outer edge a metal azimuth circle. Pivoted at the center are the primary and secondary arms, the latter having attached to it the platen or plotting device which corresponds to the particular baseline in use, and has located on it to scale, as on a map, the positions of the batteries or other stations for which the board may furnish data. Once the plotted position is obtained, the work of predicting is the same as with our present plotting board. The scale of the board is 400 yards to the inch.

The following advantages are claimed for the board:

(a) It is simple, strong and durable, and has no gears.

(b) It is universal for any baseline.

(c) It is semi-automatic in plotting.

(d) It will supply ranges and azimuths for batteries whose observing stations have gone out of action.

(e) It is accurate and positive in its work.

(f) It is cheap to construct.

(g) It is easy to operate and quick in its action.

(h) It relieves the plotter of all work except the study of the track of his target and the work of predicting.

(i) It is easily and quickly oriented for any baseline.

#### —Range Finding—Predictor

[Description of a Predictor for Gun Batteries. By Capt. Chauncey L. Fenton, Coast Artillery Corps. *Jour. U. S. Artill.*, Nov-Dec, '15. 800 words. Illus.]

This is a device for determining quickly the distance from plotted to predicted point. It consists of two parts: a prediction ruler for measuring distances on the plotting board; and a predictor for determining the travel of the target during the predicting interval plus the time of flight.

The travel of the target during the observing interval is measured on the plotting board with the prediction ruler. The travel during the predicting interval plus the time of flight for the range is determined by the predictor and then is laid off on the plotting board in the direction the target is going by use of the predicting ruler.

#### —Target Practice

[Notes on Gunnery. By 1st Lieut. George A. Wildrick, C. A. C. *Jour. U. S. Artill.*, Jan-Feb, '16. 20,000 words. Diags. Tables.]

(This is a technical artillery article and cannot be digested satisfactorily. As applied to coast artillery weapons the following subjects are treated: deviation; errors and probabilities; causes and effect of errors; observation and correction of fire; and calibration. An analysis of the target practice of the Coast Artillery School for the year 1915 is included.)

[Target Practice Ashore and Afloat. *Army & Navy Jour.*, June 3, '16. 700 words.]

New regulations have been adopted allowing commanders of forts (coast artillery) to use one-half of the ammunition allowance in any firing problem that they may select. This may result in many novel experiments. Ratings will be on the prescribed practice, but reports are to be made on the independent target practice. Land firing will be tested at Pensacola. The results of the present year's target practice are excellent. In the firing at the gun emplacement by the *New York* and *Arkansas* at Fort Morgan, the commander of the battery and three men were theoretically killed during the firing. The result of the firing would have been to put the gun out of action for 12 minutes. The battleships did remarkable firing at long ranges, but the effect on the fortification was not as great as was expected.

#### COAST DEFENSE

[The Coast a Line of Defense. Editorial. *Infantry Journal*, Jan, '16. 1300 words.]

**COAST DEFENSE—Continued**

Perhaps the most fallacious of the conceptions that arise in peace is that the sea-coast is a line of defense. Harbor defense is not alluded to, but the coast defense proper, *i.e.*, the opposition to a landing by mobile troops at any point the enemy may select. The sea-coast is like any other battle line. It must be chosen, fortified and defended in the same way. The enemy has one great advantage, too, in the uncertainty that must exist in the defender's mind up to the moment the landing is effected. A naval authority has recently emphasized the point that the enemy must be attacked before he gets ashore, since he is most vulnerable at the water front. Thereafter conditions become those of war in general. It is an axiom that no country with an extensive coast can successfully adopt the idea of coast defense as the basis of its defensive strategy.

[Effect Upon Measures for Coast Defense of the Development of Submarine and Aerial Attack. By 1st Lieut. Meade Wildrick, C. A. C. *Jour. U. S. Artill.*, Mar-Apr, '16. 13,000 words. Illus.]

(First prize, Essay Competition of 1915.)

Throughout the records of military history, no offensive weapon ever has been developed whose destructive power has not, in due course of time, been nullified by some defensive means. History is repeating itself to-day, and we find that Great Britain has evolved a system of protecting its High Seas Fleet, and in a large measure its merchant marine, against German submarines. Probably no factor has so changed military theories as has the development of aircraft and submarines.

We cannot foresee the future development of such craft, and undoubtedly the present types are but the first steps. Our problem to-day is to study their effects as demonstrated in the present European War, and to apply the lessons to our own military system and equipment.

In the future we must be prepared to meet two types of aircraft, *viz.*: dirigibles and aeroplanes. The former as yet has not flown such distances as across the Atlantic or Pacific, but we may expect such a development in the near future, and must prepare to defend against it. The measures of defense will differ only in degree from those necessary against aeroplanes. Therefore, only the latter are discussed.

The aeroplane and the hydro-aeroplane have proved of the greatest value to all belligerents in the present war, and they could be brought in large numbers on transports and warships for use in the attack of our coasts.

**The Use of Our Own Aircraft**

In its present stage of development, the aeroplane is far superior to the dirigibles for our service.

Three separate and distinct types must be developed:

1. The scout aeroplane.
2. The combat aeroplane.

3. The artillery spotting and reconnaissance aeroplane.

In general, aeroplanes should be prepared to perform the following seacoast defense duties:

1. Patrolling and oversea reconnaissance.
2. Preventing enemy air reconnaissance of seacoast defenses.
3. Spotting for our batteries.
4. Attacking hostile warships and protecting mine fields.
5. Land reconnaissance and attacking hostile artillery.

Much has been written and many schemes proposed for an aero coast patrol. One such scheme divides the Atlantic, Gulf, and Pacific coasts into 44 zones for patrolling, and assigns one aeroplane for patrolling and one in reserve for each zone. Certain portions of this patrol should be established in time of peace, especially covering that part of the coast from Portland, Me., to Norfolk, Va.; and plans should exist for putting the remainder into operation at short notice. A patrol service of this kind, supplementing the naval patrol vessels, would give twenty-four hours' warning of the hostile approach, and would enable mobile troops with heavy guns to be transported from strategic centers to meet the threatened attack at the landing point.

The scout aeroplane is the best type for this service. It should have great speed and flying radius; carry a pilot and observer, and radio outfit; and need not be heavily armed.

**Combat Aeroplanes**

The duty of the destroyer or combat aeroplane is to attack the hostile aircraft and prevent them from locating or attacking our batteries and other accessories, and from observing the effect of fire directed at these batteries. This it may do by ramming, by dropping bombs, or by using a machine gun, the latter being the most effective as shown by the war.

In time of peace at least two machines of this type should be supplied to each coast defense. These in case of need could be concentrated at threatened points. They should fulfill the following requisites: should be able to fight, should have great speed combined with lifting power, should be able to climb quickly, and should be as powerfully armed as any possible opponent.

**Spotting and Reconnaissance Aeroplanes**

The spotting and reconnaissance aeroplane undoubtedly will prove one of the most valuable adjuncts of our coast defenses in the future. Its duties will be: local reconnaissance, especially during fogs; observation of fire; protection of mine fields against submarines; control of searchlights at night; and despatch carrying. These machines should carry skilled observers familiar with the local terrain, should be equipped with signalling apparatus, should have variable speed, should be armored on the undersides, and might carry a machine gun. In addition to the combat aeroplanes, two machines of this type should be assigned permanently to each of our important coast defenses.

### *Use of Hostile Aircraft*

As shown by the operations of the European War, the important duties which we may expect to be performed by hostile aircraft will be: reconnaissance of our coast defenses, observation of fire, and bomb dropping. Therefore, we must prepare at once to meet these attacks.

These defensive measures will be considered under the headings:

1. Combat aeroplanes.
2. Anti-aircraft guns and searchlights.
3. Concealment.
4. Overhead and lateral cover.
5. Mobility.

The use of combat aeroplanes has been discussed. They have proved the best offensive weapon against hostile aircraft, and our sea-coast defenses should be equipped with them immediately.

### *Anti-aircraft Guns and Searchlights*

Anti-aircraft guns have been used extensively in the present war and with good effect against reconnaissance machines flying low. Rifle fire has proved ineffective. In the field these guns are mounted on a tripod or on a motor car. The present weaknesses of the anti-aircraft guns are the difficulty of correct ranging, and the character and destructive power of the projectiles. Shrapnel, thus far, appears to be the best projectile against aeroplanes. For night work, a searchlight specially mounted for overhead searching should form part of the same fire command as the guns.

### *Concealment*

Concealment of our seacoast armament has two main objects: 1st, to prevent hostile aircraft from locating its position and observing the effect of fire directed thereat; 2nd, to prevent hostile aircraft from attacking with bombs.

A solution is difficult, as our present batteries are easily visible at altitudes as high as four thousand feet. The ground in the vicinity should be planted with trees, shrubs, and vines, and emplacements and buildings should be painted to harmonize with the surroundings.

### *Overhead and Lateral Cover*

The present war has shown the value of cover, and also the futility of attempting to reduce forts by a fleet acting alone. These questions affect especially our present system of seacoast fortification.

Our defenses must be prepared to meet attacks from the sea, land, and air, either alone or in combination. Our present defenses are designed to withstand direct fire from ships' guns alone, and would be helpless against high angle fire from land batteries, or bombs from aeroplanes. Hence, the necessity of providing cover against such fire is apparent.

### *Mobility*

The present war has demonstrated the value of mobility, and the advisability of changing the position of a battery as soon as located by the enemy aerial scouts. The difficulty of concealing our present big gun emplace-

ments and the necessity of providing additional cover for them has been discussed. The easiest solution would seem to make these elements mobile. Two methods of transportation are practicable, one by gasoline tractor over ordinary roads, and the other by railroad car designed to be fired directly from the track. For guns over ten inches in caliber the problem of making them mobile is difficult, therefore the true solution as applied to our future system of coast defense would be to mount our large caliber guns in fixed emplacements, and to make the mortars, howitzers, small guns, and searchlights mobile.

### *Our Present System of Coast Defenses*

It is evident that our present coast defenses lack concealment, lack cover against high angle and shrapnel fire, and lack mobility. They were designed twenty years ago. To-day we are faced with new problems and conditions. In the discussion that follows, we will see how our present system can be strengthened as regards these shortcomings.

Perhaps the most vulnerable element in our coast defenses is the fire control system, the stations of which are not adequately concealed nor provided with cover. Since accuracy of plotting requires that observing points be fixed, mobility is not applicable to these stations; but an auxiliary system might be worked up.

Our stations should be redesigned to include a bomb proof roof of steel, and effective concealment by grass and shrubbery against overhead observation. A periscope observing instrument might be used. Battery commander's stations should be moved into the concrete center traverse between the guns, and have steel overhead cover.

Telephone lines should be in conduits well underground, and to insure quick repair of breaks, testing stations should be located at convenient points in the lines.

Every effort should be made to conceal the heavy gun batteries by trees and shrubbery and by proper painting of the emplacements. In addition, a steel shield affording overhead and side cover against bombs and fragments should be fastened to the racer. The gun pointer should be provided with a periscopic sight.

Mortar batteries might be concealed from aerial observation by a canvas cover stretched over the pit, painted a proper color, or covered with hay, grass, or twigs. Mortars mounted as at present are particularly vulnerable to high angle fire and aerial bombs. The most practical means of concealment is mobility.

Mortars drawn by gasoline tractors might serve the double purpose of seacoast and siege duty, using our present fire control system when firing against ships. In assisting to repel a hostile landing, their great range would keep both the covering warships and the transports well out from shore, forcing the invaders into small boats far out. Our miles of coast line railroad would make mortars mounted on flat cars a valuable form of defense, and one which could fill in the existing gaps between our present permanent fortifications. The system might be developed

**COAST DEFENSE—Continued**

further by constructing railroad tracks around all our present coast defenses, and spur tracks leading to good battery and searchlight positions. Railroad batteries of this type should be self-supporting, with complete equipment of wireless, machine guns, and searchlights.

The small gun batteries can be concealed by judicious tree planting, but best by mobility. The latter can be accomplished by putting them on wheeled mounts or on railroad cars as best suited to local conditions.

The question of protecting searchlights against all methods of attack is difficult. The daylight shelters should be concealed from view, and should be placed underground for protection from fire. For protection at night a limited mobility should be given by mounting them on wheels or on flat cars, so that if attacked they could be occulted and then moved to a new position.

According to reports from Europe, aeroplanes have been used to locate submarine mines and to direct dragging operations. Measures must be taken to render the mines invisible to aerial observation, or possibly to have a type of mine of variable submergence controlled from the mining casemate. When a hostile air-scout is seen approaching, the mine could be sunk to a greater depth.

**Effect of the Development of the Submarine upon Measures for Coast Defense**

According to the Administration Naval Program, in 1921 we shall have 157 submarines. These may be classified as fleet, coast-defense, and harbor-defense submarines.

The fleet submarine is an offensive vessel, and is only remotely connected with our coast defense problem.

The coast defense submarine, while essentially a naval weapon, is more closely related to coast defense, since our permanent coast defenses protect the navy yards and provide it with a safe base from which to operate. While the distribution and operation of the coast defense submarines is essentially a naval problem, still if all elements of the national defense are to work in harmony and meet a hostile expedition at the landing point with maximum force, there must be intimate co-operation between the War and Navy Departments.

The theater of operations of the harbor defense submarine and the coast defenses is the same, and moreover, the submarine is absolutely dependent upon the coast defenses for support and the safety of its base of operations. Therefore, the co-operation between the two services must be most intimate.

At present the value of submarines to coast defenses is somewhat problematical, because undeveloped. The general duties of harbor defense submarines would be as follows: to attack hostile ships either in the vicinity of the coast defenses or attempting to enter the harbor; to reconnoiter water areas in the vicinity of the coast defenses to discover the positions and movements of hostile ships, especially at night or in a fog; to protect mine fields against attack.

The main duties of hostile submarines would be to enter our harbors to attack war-ships, shipping, and the water front of our cities, to reconnoiter the defenses, and to attack mine fields.

The net defense employed by the British against German submarines is specially applicable to many of our harbors and could be used in closing channels and protecting mine fields against attack.

**Conclusions**

To keep our present system of coast defenses abreast of the times, the following changes are suggested:

First, that an efficient aerial service be developed to include a coast patrol, and the supplying of our coast defenses with combat and reconnaissance aeroplanes.

Second, that those elements of our coast defenses which cannot be made mobile should be made invisible to hostile aircraft, and should be provided with adequate overhead and lateral cover.

Last and most important, we find that the best defense we can give our seacoast armament against hostile aircraft is to make this armament mobile, and thereby extend our sphere of operations to include not only the defense of our harbors, but the defense of our entire coast.

[Land Defense. By Col. C. G. Morton, 5th Inf. *Army & Navy Jour.*, June 10, '16. 750 words.]

Three pamphlets have just been published by the War College Division of the General Staff, bearing upon fortifications and the use of artillery in co-operation with other troops.

Harbor defense, miscalled coast defense, is but a part of land defense. The principles of fortifications remain unchanged, but the applications vary with the developments in weapons. We know pretty well the lessons of Port Arthur and Tsing-tao, but the nations in the present war no longer permit free and full observation. If any opportunity occurs to study the experience, we should take full advantage of it.

See also

**COAST ARTILLERY—RANGE FINDING—PLOT-  
TING BOARD**

**LANDING OPERATIONS**

**NAVAL ARTILLERY**

See also *subhead* COAST DEFENSE under  
names of specific countries

**Sweden**

[Notes on the History of the Present Swedish Coast Fortresses. By Lieut. Ake Kayser, Royal Coast Artillery. *Svensk Kust-artilleritidskrift*, Vol. 11, Part 1, '16. 2600 words.]

III. Vaxholms and Alvsborgs fortresses during the reigns of Gustavus Adolphus and Queen Christina.

(Historical article.)

**United States**

[Fortifications Appropriations. *Army & Navy Jour.*, July 8, '16. 1600 words.]

As finally agreed to in conference, the fortifications appropriation bill carries \$25,748,050 in cash and contract authorizations of \$13,800,000, a total of \$39,548,050. The bill carries a total of \$9,000,000 for field artillery ammunition.

#### —Against Naval Attack

[Note. *Army & Navy Jour.*, Mar 25, '16. 300 words.]

An important test of the effect of heavy gun fire from warships was made at Mobile, Mar 13 and 14. The target was an emplacement of service type with gun mounted. The emplacement was struck a number of times, but the damage was slight. At least 60 rounds of high explosive shell were fired. The gun crew was represented by dummies and twelve goats were placed at different points. The fire killed none of the goats and would have killed none of the crew. The naval gunnery was superb. The details of the test will not be made public.

[Unusual Army-Navy Test. *Army & Navy Register*, Mar 25, '16. 300 words.]

At Fort Morgan, Alabama, the 12-inch guns of the *Arkansas* and the 14-inch guns of the *New York* were fired at ranges from 6000 to 16,000 yards at a target consisting of an emplacement similar to the permanent defense works, mounting a 10-inch gun on disappearing carriage. The shots did no material damage, the gun and mount being in condition for service at the conclusion of the test. No details are given out, and it was not intended that it should become publicly known. Other tests of like character will probably be made, but they will probably not be made known in advance.

[The Navy and Coast Defense During the European War. By Capt. P. W. Morner. *Dansk Artilleri Tidsskrift*, Mar, '16. 6300 words.]

(Taking his information from official reports and from letters written by eyewitnesses, the author first gives a description of the naval engagements during the latter part of 1914. He then gives a brief description of the defenses of the Dardanelles and a chronological narrative of the operations there from the time of the first attack in Nov, 1914, until the landing of troops in Apr, 1915. He deals principally with the ranges at which the battles were fought, the armament used, and the effects of the fire on ships, fortifications, and personnel.—Ed.)

Long-range actions are now the predominant feature of all naval engagements. Fire is usually opened at 19 km. During the Russo-Japanese war, the stronger party, as a rule, forced a decision at short range (4-5 km.), while now the endeavor is made to strike the decisive blow at long ranges (10-16 km.). To accomplish this, advantage is taken of superior speed and greater range of guns. Such tactics are based upon the experiences from the Japanese war, and have been confirmed during the present war. A ship can be put out of

action solely by shell-fire, which ruins its power of navigation, destroys its fire-control apparatus, and ravages the whole ship with fire and explosions. The fight off the Falkland Islands illustrates this in a very distinct manner. Thus it would appear that the battle cruiser, which, with superior speed, is able to force the engagement at long range, has a good chance against the "dreadnought," whose heavier armor protection is of no added advantage at such ranges.

Admiral Rojestvensky said, after the Russo-Japanese war, that the deadliest enemy of the battleship was the wall of fire created by the incessant bursting of projectiles. The present war has largely confirmed his opinion. In most reports expressions like "the vessel caught fire, later on followed by explosions," can be read. It must be borne in mind, however, that the more important ships which have been sunk by fire during this war were of an older date and have not benefited from the experiences obtained during the war as to the value of the fire-extinguishing apparatus. In spite of all technical progress and care in the manufacture of ammunition, there seems to have been a considerable number of non-bursts, although the percentage is smaller than during the Japanese war, where it is reported to have been 65 per cent. As on land, a characteristic feature of war on sea is the huge consumption of ammunition, which far exceeds all calculations. The effect of high explosive shells bursting within 10 meters of the ship's bottom is said to be as dangerous as a direct hit below the water-line. High water-columns around a vessel caused by bursts on impact make the gunlayer's task a difficult one. This should be a hint to coast artillerymen in the choice of where to aim and where to hit.

The indirect fire of the *Canopus* off the Falkland Islands, and of the *Queen Elizabeth* at the Dardanelles, shows that long-range fire, in connection with aeroplanes and balloon observation, is a great advantage.

As regards coast defenses, temporary field works have been of special value. Batteries quickly built and well concealed have been most fatal to the assailant. Movable or well-hidden mortar batteries have shown their high efficiency. Such batteries will find their place in most coast-defense constructions of the future. The 6-inch gun has been very efficient against the unarmored parts of the vessel during the fights at the Dardanelles.

[The Armament of Coast Fortifications and Their Service in Warding Off an Attack by a Modern Fleet of War Ships. *Svensk Kustartilleritidskrift*, Vol. 2, Parts 3 and 4, '16. Translation.]

(This is the gold medal article which appeared in *Rivista d'Artiglieria e Genio*, 1913, by Renzo Garonne, Capt. Italian Artillery.)

[Submarines at Fortified Naval Bases. By Lieut. I. Leufen, Royal Coast Artillery. *Svensk Kustartilleritidskrift*, Vol. 2, Part 1, '16. 2300 words.]

**COAST DEFENSE—Continued**

(The subject is discussed under the following subheads: Making an effective blockade of the base more difficult; strengthening the defensive and offensive power of the fortress; the moral effect of having an offensive weapon within the fortress; reconnaissance and guarding.)

See also

**MINES—SUBMARINE****—By Heavy Guns**

[Note. *Army & Navy Jour.*, Aug 19, '16. 250 words.]

Under recent appropriations, the Watervliet Arsenal is being fitted to build the new 16-inch army guns. The first guns of this type will be emplaced at Cape Henry, and later ones at the Panama Canal. The guns will be 50 calibers long. The projectile will weigh 2400 lbs. and its range will be practically limited by the elevation as a theoretical range of 50,000 yards is possible.

**—By Mines**

See

**MINES—SUBMARINE****—By Mobile Guns**

[Vast Defense Scheme Takes in Railroads for Swift Transfer of Heavy Guns. *New York Herald*, Jan 2, '15. 2400 words. One illustration.]

This scheme, devised by L. W. Luellen and C. F. Dawson, with the advice, assistance and co-operation of certain senior officers of the army, contemplates the use of heavy guns mounted on special railway cars, so designed that the cars can be locked to concrete platforms and be immediately ready for use. Advantage will thus be taken of the coastal railways and specially constructed spurs to transport the armament to threatened points. The estimated cost of applying the scheme to a section of the coast from Massachusetts to New Jersey inclusive is \$10,000,000, and for the entire coast \$50,000,000. Plans have been prepared in detail including the cars, mortars, and platforms.

(In the description given, no fire control system appears to be contemplated other than aeroplane observation. How this is to be applied is not stated.—Ed.)

[The Use of Heavy Mobile Artillery in Conjunction with our Seacoast Armament. By 1st Lieut. Meade Wildrick, C. A. C. *Jour. U. S. Artill.*, Jan-Feb, '16. 4500 words. Illus.]

(This discussion is intended to supplement the article by the same author entitled "The Use of our Seacoast Guns and Mortars in Land Defense" in the July-Aug issue, *Journal U. S. Artillery*.)

One of the greatest lessons learned so far in the present European war is the increased importance of heavy mobile artillery. As yet our knowledge of the details of the mechanism and operation of these new engines of war is meager and confused. Nevertheless, in case of war with a modern military power we must expect to be confronted, in our mili-

tary operations, with hostile howitzers and mortars of large caliber and great destructive power. To offset this advantage it is necessary for us to take to heart the lessons taught, and to devise some scheme whereby we can use effectively our own seacoast armament or any other mobile heavy artillery that may be provided in the near future. Coast artillery troops, by reason of their training, are especially fitted to handle this class of artillery.

The type of howitzer or mortar most suited for this system can best be devised by the Ordnance Department. It might prove practicable to design a mount for our present seacoast mortar which would make this weapon mobile and enable it to be easily transported and quickly mounted. But whatever the design, it should fulfill the following requirements:

1. It should be mobile and capable of being transported quickly either by railroad on flat cars or by gasoline tractors over ordinary roads.

2. It should be capable of being mounted quickly on a concrete emplacement of simple design.

3. It should be more powerful than any similar weapon that can be brought against it.

4. In addition to being equipped with the ordinary telescopic sight, it should be practicable to lay it in azimuth and range as is done with our present type of seacoast mortars.

In drawing up a project for the defense of a given locality on the seacoast, sites for mobile howitzer batteries should be selected for defense against attack from the land side. The emplacements for these batteries might be constructed in time of peace or upon the outbreak of war. Each coast defense should be equipped permanently with one or more of these batteries to supplement the fixed armament and for the purpose of training coast artillery companies in their use. The remainder of the batteries might be kept at centrally located depots ready for shipment to any threatened point by special trains.

The main requisite in the fire control system of these batteries is an accurate map to a scale of 3-inches = 1-mile and laid off in squares 4000 yards to a side. Military topographical details should be so accurately located that a scout will be able to plot a target on the map within one-tenth of an inch of its actual location. Scouts and aeroplane observers should be trained carefully in conjunction with the map in locating targets on the map and in sending back the correct data to battery commanders. The maps should be prepared and training in their use should be had in time of peace.

A similar system might be applied to operations of the same armament with large armies in the field. Maps and emplacements could not be prepared in advance. We must utilize the best available existing maps, and construct the emplacements and mount the mortars as rapidly as possible after the battery position has been determined. While the



battery is being mounted the work of laying out the squares on the map could be done. Targets then would be located and the fire observed by aeroplane, the observer signalling to the battery commander the proper data.

—Use of Aeroplanes in

[Aeroplanes for Coast Guard. By Mayo Dudley. *Flying*, May, '16. 1380 words. One illustration.]

Experience with aeroplanes has proven that they can be used in facilitating the work of the Coast Guard in searching for derelicts, in locating ships in distress, or in locating small boats containing fishermen being carried out to sea. They would also be of great assistance to ship-wrecked vessels and in saving life and property from the perils of the sea. According to Acting Sec. Newton, of 86 calls for assistance answered by the Coast Guard Cutter *Onondaga* between Dec 1, 1914, and Dec 1, 1915, at least 38 could have been answered by aircraft and failures to rescue and salvage might have been obviated. He proposes ten aviation stations located at those points on the coasts and the Great Lakes where statistics of maritime disasters show them to be most desirable, and recommends ten additional third lieutenants and five additional third lieutenants of engineers for aviators. A bill has been introduced into Congress accordingly.

[Scouting Flights and the Defense of Isolated Naval Bases. By Major Henry C. Davis, U. S. Marine Corps. *Flying*, Apr, '16. 1500 words. One diagram.]

The defense of army or navy bases on islands should be made at the water line. The garrison requires timely warning of an impending attack, and the fast air scout is the best means of giving such warning.

Our over-sea bases can probably not be reinforced or provided with new supplies after war breaks out, hence it is imperatively necessary to provide them with aero craft. Such craft will give early information of the point of landing of an attacking force, and thus enable the best measures of defense to be taken.

Scout vessels might give the information, but they might be sunk, and one scout vessel would cost as much as many aeroplanes. In any case, scout vessels should not be tied to shore defenses.

The hydroaeroplane is the ideal for scouting around an island base, but aeroplanes are more likely to be furnished. Assuming a squadron of eight, each of seven hours' endurance and 75 m.p.h. speed, each machine can climb to 4000 feet, proceed to a distance of 225 miles with a radius of vision of 70 miles more. Thus will be had from 20 to 30 hours' notice of the approach of an enemy.

A scheme for scouting is illustrated by which the machine on each trip covers an equilateral triangle 75 miles on a leg. Four such trips would cover the horizon to a distance of 150 miles quite thoroughly. The departure of an

enemy expedition will probably be known, and his probable destination. Upon this basis a scheme of scouting can be devised.

The aero scout will be an effective adjunct of the defense of oversea bases, not as a bomb-dropper, but on its legitimate duty as a scout. As such, it will amply repay the necessary outlay.

See also

UNITED STATES—COAST DEFENSE—AEROPLANE SCOUTS

## COLLEGES

### —Military Training in

[Military Drill at Harvard. *Army & Navy Register*, Dec 18, '15. 600 words.]

The general sentiment at Harvard has become so strong in favor of voluntary military training for the university, that the student council has appointed a committee to inaugurate a system of training and to organize a company of students.

The drilling of the company will be under the direction of an army officer, and the lectures will be given by an expert in military science.

Since the military drill will be arranged so that it will in no way interfere with scholastic work or athletics, it is hoped that enough men will enlist to form an infantry regiment of 1200.

See also

EDUCATION, MILITARY—IN SCHOOLS AND COLLEGES

## COLOMBIA, United States of

### —Army

See also

INFANTRY—ARMS

[Article: "The Machete and the Colombian Soldier"]

### —Army—Reorganization

[Note. *Army & Navy Jour.*, Sept 2, '16. 50 words.]

In accordance with a recent request of the government of the U. S. of Colombia, the Swiss Government will send three competent Swiss officers to Colombia for a period of three years to reorganize the Colombian army along Swiss lines.

### —Army—Supply and Transport

See

SUPPLY AND TRANSPORT—COLOMBIA, UNITED STATES OF

### —Compulsory Military Service

[Compulsory Military Service. By Major J. Aranguren, Infantry. *Mem. Estado Mayor* (Colombia), Apr, '16. 1400 words. Two photographs.]

The first contingent of conscripts, authorized by the law of Dec, 1896, was received on Aug 12, '12. The application of this law was first tried with the garrisons of Bogota and Tunja.

This delay of sixteen years, between the passage of the law and its execution, was due to the lack of military organization and to the fear by political circles that universal service would be a menace to the life of the nation.

**COLOMBIA, United States of—Continued**

To-day, it can be said that all citizens calmly await their drawing, and they lose no time in fulfilling the sacred duty of serving their country.

Numerous benefits may be cited as the result of compulsory service, one of the most important being the improvement in the manner of collecting data for the national census. The presence of commanders of recruiting districts within the towns in their jurisdiction prepares the minds of the people. In addition, these officials submit, every six months, reports on the character of the inhabitants, condition of roads, railroads, waterways, crops, manufactures, and other important data, which after compilation, will serve as the basis of statistical reports from the government.

Compulsory military service is especially beneficial to the weaklings who come from the lowlands. Medical science can do nothing for them, but after a short period of military training, they become strong and agile, skillful workmen, hard to replace in the walks of human activities. Upon returning home, after one year's service, these men have undergone such changes that their families and fellow townsmen are agreeably surprised. (Comparative photographs given.)

When a man leaves the barracks, he knows that he has acquired the rights of a citizen; that social inequality is not servitude; that he lives in a democratic country and, consequently, is a free man. Blessed be the compulsory military training, which transforming, reforming body and soul, renders invincible the nations in arms.

**—History**

[Historical Document. From the archives of Gen. Santander. Editorial. *Memo. Estado Mayor* (Colombia), June, '15. 2000 words.]

Three letters from Simon Bolivar to Gen. Santander dealing with the condition of the troops; the manner in which the operations should be conducted up to the end of the year 1820; and the armistice which terminated the revolt against Spain and resulted in the independence of Colombia.

**See also**

BOYACA, BATTLE OF

**—History—1829****See**

TARQUI—BATTLE OF

**—Military Schools****See**

SCHOOLS, MILITARY—COLOMBIA

**COMMISSARY****See also**

KITCHENS, MILITARY  
RATIONS

**COMMUNICATIONS****See**

LINE OF COMMUNICATION  
SIGNALLING

**COMPASS**

[Illuminated Compasses for the Army. *Army & Navy Register*, Aug 12, '16. 200 words.]

There is need for luminous dial compasses for night use in the army. These, or the materials for their construction, have come from Germany, hence are no longer procurable.

Attempts are being made to find a solution of the difficulty by home manufacturers.

**COMPULSORY MILITARY SERVICE**

[Conscription and Eugenics. Editorial. *Independent*. Feb 7, '16. 800 words.]

Much of the present discussion over conscription does not touch basic principles. The nearest approach is by those who insist upon the democratic quality of universal service. It treats all alike, whereas the draft in our Civil War caught the poor man while the rich man hired a substitute. The superb solidarity of France and the factional struggle in Great Britain show the fundamental equality and justice of the universal service system.

President C. A. Richmond, of Union College, calls attention to a consideration which has been almost overlooked. Union College furnished one hundred and eighty men to the army from its small body of graduates. Nine thousand Oxford men and over ten thousand Cambridge men are serving in the British army. If the United States were attacked by a foreign power, patriotism similar to that shown fifty years ago would send 75% of college men to the colors, whereas the unskilled class would furnish no more than 25% of their numbers. This is the bed-rock meaning of a volunteer system. While the strategists and corps commanders are experimentally learning their jobs and making the tragic mistakes that mark the early stages of every war, the brunt of the fighting and slaughter will be borne by men who collectively represent relatively high moral qualities, relatively high intelligence and relatively high physique of a nation's population. Meanwhile the physically unfit, the slackers, and the unskilled in vast numbers are safe at home. Our future military policy should weigh the effect of this condition upon the problem of eugenics.

**See also**

ARGENTINA—COMPULSORY MILITARY SERVICE  
COLOMBIA, UNITED STATES OF—COMPULSORY MILITARY SERVICE

GREAT BRITAIN—ARMY—RECRUITING

GREAT BRITAIN—COMPULSORY MILITARY SERVICE

UNITED STATES—COMPULSORY MILITARY SERVICE

**CONSCRIPTION****See**

COMPULSORY MILITARY SERVICE

**"CONTINENTAL ARMY"****See**

UNITED STATES—MILITARY POLICY OF—"CONTINENTAL ARMY"

**COOKING EQUIPAGE****See also**

KITCHENS, MILITARY

**COPPER****—Use of in War**

[Copper and Zinc in Peace and War. Félix Bona. *Memorial de Artillería*, Madrid, July, 1916, pp. 42-68.]

In the May issue of the *Memorial* the author considered the subjects of iron and coal, absolutely essential elements in modern warfare. He now discusses copper and zinc, next in importance, although lead, tin and antimony are not far behind.

The production of copper for the year 1915 was as follows:

United States .....	646,216	tons
Mexico .....	30,969	"
Canada .....	47,202	"
Cuba .....	8,836	"
Australia .....	32,512	"
Peru .....	32,410	"
Chile .....	3,000	"
Bolivia .....	3,000	"
Japan .....	75,000	"
Russia .....	16,000	"
Germany .....	35,000	"
Africa .....	27,000	"
Spain and Portugal.....	35,000	"
Other Countries.....	25,000	"

Total .....1,061,283 tons

The United States produced nearly two-thirds of the entire output of the world, its nearest competitor, Japan, producing only one-ninth as much. The Lake Superior copper excels all others for the manufacture of brass for military purposes. Germany, with a production of 35,000 tons, consumed in military and civil manufactures in 1911 225,800 tons.

In modern warfare copper is used for cartridge cases for small arms and for rapid firers, for primers, for fuse cases and for rotating bands, and is largely displacing lead as a material for bullets. A small arms cartridge case averages 10 grams of copper, or ten tons per million rounds. A battalion of 1000 men in action for one day will fire one million rounds. If four-fifths of the empty cases be gathered up, there is still a definite loss of two tons of copper. If the bullets be copper jacketed, this amounts to 2.5 tons. If the bullets be copper, the waste would amount to 12 tons.

The cartridge case of the Spanish field piece consumes one kilogram of copper, and if after action four-fifths of the empty cases be recovered, there is still a loss of 2.5 tons per 1000 rounds. In addition to this, the rotating bands will amount to 1.5 tons and the time and percussion fuses to five tons, or a loss of nine tons per 1000 rounds. A corps of 50,000 men in action for one day would therefore expend 575 tons of copper. For round numbers, call this 500 tons. If for one year there should be an average of one corps in action per day, the expenditure of copper would amount to 180,000 tons. Additional vast quantities are required for electrical purposes.

The annual output of Germany, 35,000 tons, is thus entirely insufficient to supply her needs. She had accumulated large stores before the outbreak of the war and since that time has purchased more, regardless of price. Much copper is smuggled in through leaks

in the blockade. The government has requisitioned all household and kitchen utensils of copper and brass and this source has yielded some 15,000 tons.

France, Italy and England produce no appreciable amount of copper but control of the sea permits importation from North and South America, from Spain, from Africa, etc.

The Russians when they fell back before the German advance of last year were careful to remove with them all of the church bells, dynamos, electric cables and other articles of copper and brass. The output of copper in Russia has fallen off one-half in the last twelve months and her supplies are derived mainly from Japan and Australia through Vladivostok. The price of copper has practically doubled since the outbreak of the war. From a military standpoint, the main use of zinc is alloyed with copper to form brass. Germany and Belgium are the principal European producers of zinc, the output in 1911 being nearly 500,000 tons. This source being shut off to the allies and to others by the war, the price of zinc has increased fourfold.

#### CORONEL, Battle off

[The Naval Battle off Coronel, Nov 1, 1914. Report of Admiral Count v. Spee. Editorial. *Artill. Monatshefte*, July-Aug, '15, 1200 words.]

(NOTE.—This is a remarkable account, not susceptible of further condensation. Only the salient points can be touched.)

The German squadron consisted of the armored cruisers *Scharnhorst*, *Gneisenau*, and the protected cruisers *Nürnberg*, *Leipzig*, and *Dresden*. Reliable information on the night of Oct 31, 1914, reported the enemy off Coronel. Course was at once laid south, and at 4:17 p. m., Nov 1, the British squadron consisting of the cruisers *Monmouth*, *Glasgow*, and the auxiliary cruiser *Otranto*, was sighted. Wind and sea being very high, v. Spee steered his course to the west so as to be placed in the lee position and in order to cut off the enemy from the Chilean coast. Wireless communication was disturbed as much as possible. At 5:20 p. m., the *Good Hope*, Admiral Cradock, was sighted and joined the British squadron. At 6 p. m. both squadrons were steering south in parallel courses about 13,500 m. apart. At 6:30 p. m. the Germans opened fire at 10,400 m. Observation and range finding were difficult on account of the high seas. The small cruisers could use some of their guns only intermittently. Hits were observed on the *Good Hope* at 6:39 p. m. At 6:53 p. m., at 6000 m. range, course was changed away from the enemy. The *Good Hope* and *Monmouth* were badly damaged and on fire. Darkness was setting in rapidly. It was observed that in spite of change in course, the range closed to 4900 m. The enemy had evidently given up hope of a successful artillery duel and was maneuvering to use his torpedoes, for which purpose the moon would have been favorable. The large cruisers were therefore drawn off and the small cruisers sent in to torpedo the enemy. At 7:23 p. m. an explosion was observed on the *Good Hope*.

**CORONEL, Battle of—Continued**

From that time on neither the *Good Hope* nor the *Monmouth* fired again. The *Good Hope* could not be found in the darkness and had evidently sunk. The *Monmouth* was pursued by the *Nürnberg* and sunk at 8.58 p.m. The *Orlando* made its escape early in the fight. The *Glasgow* remained at a good distance and escaped in the darkness. The *Scharnhorst* was struck twice, the *Gneisenau* four times. The small cruisers suffered neither losses nor damage. The *Gneisenau* had two wounded.

**COTTON****—As a Source of Explosives**

[From Factory to Firing Line. ("The life-story of a piece of cotton used for military purposes.") By Captain O. F. G. Hogg, R.G.A. *Jour. Royal Artillery*, Feb, '16. 3500 words.]

Some time ago the newspapers were full of articles dealing with the contraband of cotton, which was exploited with varying degrees of energy on both sides of the question. To the ordinary reader this is confusing and he asks himself the question, "Is cotton all-important for military purposes, or can its use be replaced?"

An explosive is a solid or liquid substance or mixture of substances, which is liable, upon the application of heat or a blow to a small portion of the mass, to be converted in a very short interval of time into other more stable substances, either largely or wholly gaseous.

Explosives are conveniently classed under two main headings:

(a) Propellants.

(b) Disruptives.

A propellant is an explosive such that its rate of decomposition can be regulated to some extent within certain time limits, i.e., its rate of burning can be controlled and is comparatively speaking slow. As their name implies, they are used for purposes of propulsion, such as that of a projectile from a gun.

A disruptive, on the other hand, is a substance used for a shattering effect. It does not explode in the true sense of that term, it detonates. A high explosive to act as such must be detonated. It may be burned, but then it explodes and its power and usefulness are lost. Detonators are composed mainly of such substances as fulminate of mercury.

Under certain conditions propellants may be detonated and disruptives exploded. This is how cotton can be used in both capacities.

As a disruptive, guncotton or nitro-cellulose is only employed for demolitions in the field and for torpedoes and mines. Its use is limited and it could be replaced. The greatest percentage of high explosives used for war purposes is in shells and bombs, for which are used such substances as lyddite, trinitrotoluol, melinite, etc., made from nitrating coal tar derivatives.

But as a propellant cotton appears to be a necessity, for it is used in different forms by all European governments. If unobtainable, the fighting efficiency of an army would be im-

paired seriously. The propellant made from cotton used in the British service is cordite, and consists of guncotton, nitroglycerine, and mineral jelly. The French "Poudre B" is composed of soluble and insoluble nitro-cottons and diphenylamine. Germany uses a mixture of nitro-cellulose, nitro-glycerine, mineral jelly and diphenylamine. The Russian and Italian powders have similar compositions. Thus each country uses nitrated cotton as a constituent of its propellant. The story here told is of the manufacture of cordite and is interesting as the methods are similar for all countries.

Cotton in the form of cotton waste is used for smokeless powders. Before nitration it must be purified, which consists in boiling the waste with benzol or caustic soda to remove any oil or fatty matter; then bleaching with bleaching powder to remove coloring matter and other impurities; and lastly treating it with weak acid.

The purified cotton waste is then picked over by hand to remove obvious foreign matter, after which it is put through the teasing machine which separates the fibre and opens out knots and lumps.

On emerging from the teasing machine it is carried through a hot air drying machine, then weighed out and put in iron boxes fitted with lids to cool preparatory to nitration. When ready, the contents of the iron boxes are immersed in a mixture of nitric and sulphuric acids and water. This turns it into nitro-cellulose, the process requiring about 2½ hours.

The nitro-cellulose is next washed. The first washing takes place in the nitrating pans by displacing by water the acids remaining in the pans; and all other washings in the vat house. Here the nitro-cellulose receives seven boilings of various lengths with a cold water bath before each boiling. It is 87 hours in the vat.

From the vat house the nitro-cellulose goes to the pulping or beating machine, where it is mixed with water and ground into a finely divided state. This takes about 1¼ hours. From the beating machine the pulp flows to the poacher, passing over devices to remove any particles of iron or steel, grit and wood. In the poacher, it is given three washings with the proper amount of caustic soda and lime to give the required degree of alkalinity.

The washed pulp is now drawn off into a stuff chest from which it passes to the moulding machine, where part of the water is pressed out and the pulp is moulded into cylinders convenient for handling.

The moulded cylinders containing about 40% of water are next dried in guncotton stoves for about four days until the water content is reduced to about one per cent. When dried, the guncotton is taken to the weighing house where the requisite amounts are weighed out and placed in bags. The bags are taken to the mixing house, where the guncotton is mixed by hand with the proper proportion of nitroglycerine, which mixture is known as *paste*. The paste now

goes to the incorporator, where it is mixed thoroughly, and a solvent and the mineral jelly added. Incorporation requires 6 or 7 hours. The mixture now is known as *dough*.

The dough is put through presses which make it into long cords (cordite) of varying diameters, according to the gun for which intended. The cords are cut into sticks of the required length of the cartridges and placed on trays.

The cordite is dried for varying periods up to about 5 weeks, depending upon the size of the grain. The completed cordite next is blended and packed in boxes, the lot being given a distinguishing number.

The lot is now tested and proved and its ballistic results noted. If satisfactory, it is passed to the Royal Laboratory for the manufacture of cartridges.

It is interesting to follow a cartridge over its journey to the firing line, for example the cartridge for the 60 pdr. heavy gun.

At the Royal Laboratory the correct weight of cordite of a size appropriate to the gun is taken. The sticks are bound together and placed in a cartridge case of silk cloth. On the bag is stenciled all information concerning that lot of powder. The cartridges are packed in boxes and handed over to the Army Ordnance Department for issue.

The boxes are transported overseas to the ammunition base and from thence transported by rail to railhead, where they are kept until moved to the front by motor lorries to the Army Artillery Park.

When required by a certain artillery brigade, they are transferred from the artillery park to the brigade ammunition column, from which in turn they are sent up to the first line of one of its batteries.

On arrival at the battery position the cartridges are stored in an ammunition pit or cover near the guns until used. If all operations of manufacture succeeded each other without cessation, the shortest possible time in which the cotton could reach the battery is about eight weeks.

## CRIMEAN WAR

[Some Aspects of Great Campaigns.—The Crimean War. By Captain R. G. Cherry, R. F. A. *Jour. Royal Artillery*, Dec, '15. 6300 words. 3 maps.]

While the Crimean War is full of thrilling incidents and heroic deeds, to the student looking for lessons it is singularly barren of results; but during its course we are able to trace the value of some of the maxims of the Field Service Regulations. Diary of the war:—

- 1853 July 21.—Russian troops cross the Pruth.
- Oct. 23.—Turkey declares war on Russia.
- Nov. 30.—Russian fleet destroys Turkish squadron at Sinope.
- 1854 Mar.—England and France declare war on Russia.
- June 3.—Austria, backed by Prussia, demands evacuation by Russia of Balkan Principalities.

Aug. 2.—Russian troops withdrawn.

Sept. 7.—Allied armies sail from Varna.

Sept. 18.—Allied armies land at Kalamita Bay.

Sept. 20.—Battle of the Alma.

Sept. 26.—British advanced troops seize Balacava Bay.

Oct. 17.—First bombardment of Sebastopol.

Oct. 25.—Mentchikoff attacks British camp—Battle of Balacava.

Nov. 5.—Battle of Inkerman.

In all campaigns, it is essential that the side that assumes the offensive should have a clearly defined objective which should be kept constantly in view. In this war, the Crimean Peninsula was the natural objective of the allies, since they could accomplish nothing by an invasion of the mainland of Russia, and Sebastopol was the Russian naval base in the Black Sea and the point of greatest menace to Turkey, against which country the Russian campaign was directed.

The command of the sea held by the allies permitted the operations against the Crimea to be carried on, and in fact permitted England and France to intervene in the war at all.

Preparations for the expedition against Sebastopol went on all summer, the base of operations being established at Varna. The allied forces landed at Kalamita Bay, north of Sebastopol, and marched down the coast. Their right flank was covered and supported by the fleet, which also bottled up in the harbor of Sebastopol the Russian Black Sea fleet.

One of the principles emphasized in the Field Service Regulations is that of co-operation between all commanders of whatever grade. The lack of co-operation and inefficient supreme direction almost lost the allies the battle of the Alma, and caused the Russian failure in the battle of Inkerman.

In the first bombardment of Sebastopol, the allied fleet was sent in to attack the forts in conjunction with the bombardment by the land batteries. Their fire did little damage to the forts, but the ships themselves suffered considerable loss. Thus the command of the sea, upon which the allied success depended, might have been lost. It would seem that every purpose might have been served if the fleet, instead of making a serious attack, had made simply a demonstration and had continued its close blockade.

## CUBA

—Army

See also

SCHOOLS, MILITARY—CUBA

—Army—Organization

["The Reorganization of the Cuban Army." An abstract of a decree by the President of the Cuban Republic. By Capt. O. E. Hunt, Assoc. Prof. Modern Languages, West Point, N. Y. *Infantry Jour.*, Oct, '15. 4000 words.]

The army shall consist of a general staff, six regiments of cavalry, one of infantry, one of artillery, a sanitary corps, a judge advocate general's department, the retired officers and enlisted men, and such militia as may be organized.

**CUBA—Continued**

Each cavalry regiment comprises six troops, a machine-gun platoon, a pack train, and a third squadron of six troops of 100 men each. Certain troops charged with rural duties have an officer and 51 enlisted men in addition to usual quota.

Each infantry regiment has three battalions, organized as in the U. S., plus a battalion quartermaster and commissary sergeant, and six privates. Companies have 100 men each.

The artillery regiment has ten companies, one light battery and one mountain battery. The staff is the same as that of the infantry battalion, and companies have the same strength, arms and organization as infantry companies. A light battery has 133 enlisted.

Promotion is made by seniority until the grade of first lieutenant is reached. Out of each five promotions to captain, one is made by selection; one from every four to major; one from every three to lieutenant-colonel; and one from every two to colonel, the others being by seniority. The President may promote for extraordinary service in time of war, but subject to limitations and tests, all of which are public and published to the entire army. No officer can obtain two successive promotions by selection. Detached service laws are about as those of the U. S., upon whose system, in fact, is based the entire organization.

A military academy is provided for. Military service is compulsory between the ages of 18 and 45. Pay of both officers and men is about three-quarter of that of the U. S. army. Extra pay is allowed, also increase for continuous service.

Service in campaign shall count double in the adjustment of pay and seniority. In case of war, steamship and railroad lines must give precedence to military transportation.

**CYRENE**

[Cyrene, Past, Present and Future. By Giuseppe Sticca. *Riv. Mil. Italiana*, July, '16. 9000 words. Illustrations.]

Cyrene has 25 centuries of history, but little less than Rome. It was founded as a Greek colony in the 7th century B. C. The city flourished and grew to a population of over 100,000, becoming a center of wealth and culture. Its independence came to an end in 323 B. C., when it shared with Egypt the fate of being conquered by Alexander the Great. After his death it was ruled for three centuries by the Pharaohs. Then it fell under the sway of Rome and so continued till the downfall of the Roman Empire.

After being plundered by the barbarians, it was under the rule of the Byzantine Empire for a century, and then fell before the formidable power of Mohammed. The Arabs reduced it to a desert waste. The country was conquered in 1551 by the Turks, who held it till 1714, when it came into the possession of an Arab whose descendants continued to rule it till 1835. At that time it again came into the hands of the Turks who retained possession till 1913, when the Italians took control.

It is to be noted that while the coast has

been known for 25 centuries, the interior was not explored till the 19th century.

Many impressive ruins of the vast splendor of the city remain to be seen. Explorations have brought to light tombs, temples, amphitheaters, aqueducts and reservoirs. But the richest finds have been the works of art, particularly in marble. Many statues have been found, nearly all mutilated by the loss of heads and arms, but bearing the stamp of Greek genius.

The surrounding country is full of interest. Its most striking feature is the abundance of water, which is one of its greatest resources and distinguishes it from the proverbial African desert. Roads lead from Cyrene to the neighboring towns, which are nothing more than squalid settlements of Arabs.

In spite of its present abandoned condition, Cyrene is destined to become the capital of Italy's African possessions. No other place in Libya has so many attractions and advantages.

**DARDANELLES**

[The Bosphorus and the Dardanelles. By Gen. Pietro Citati. *Riv. Mil. Italiana*, June, '16. 2000 words.]

Peter the Great, after creating the Russian fleet, sent to Constantinople the first Russian envoy extraordinary, charged with the duty of making a treaty allowing Russian ships freedom of navigation on the Black Sea and to Constantinople. The reply of the Sultan, given by his Greek private secretary, Alessandro Maurocordate, was that the navigation of the Black Sea was prohibited to all foreign vessels. For two centuries this has been the attitude of Turkey toward Russia.

Meanwhile, Russia has gradually acquired more and more of the shore of the prohibited sea, but her diplomatic attitude toward Turkey on this question has been persuasive rather than forcible. England has supported Turkey in keeping the straits closed. Russia tried without success to interest Germany on her side. At the Congress of London in 1856, England and Turkey managed to uphold the principle of closure, but conceded that the Sultan should have power to open the straits in time of peace to ships of friendly and allied powers. No greater concession than this was granted to Russia after the Russo-Turkish War, and Russia has been forced to remain imprisoned in the Black Sea.

We believe that the power that holds the straits has the right to close them, or to open them to its allies. The only way for Russia to control the straits is by holding the sovereignty of Constantinople. We cannot predict to whom the straits will belong at the close of the present war. We believe that they will have to be closed to everybody or opened to everybody, and we think the latter is the better solution of the question.

See

NAVAL OPERATIONS—ATTACK

(Article: "The Failure to Capture Cattaro and the Dardanelles")

**DARDANELLES, Operations at the (1914)**

[Significance of Events at the Dardanelles. By Major General von Richter. *Jahrbücher, deutsche A. u. M.* May, '15. 1600 words.]

Since February the allied operations at the Dardanelles have claimed a considerable portion of the interest, theretofore centered on the eastern and western theatres of war.

Russia has need of more convenient means of access to the sea and channels of world commerce. She lost Port Arthur in 1905. Her efforts to secure an outlet by way of the Scandinavian peninsula have failed. Vladivostok and Archangel are ice-bound and therefore unavailable as seaports during considerable portions of each year. The route through the Bosphorus, the Sea of Marmora, and the Dardanelles offers the best means of meeting an evident need.

Since the days of Peter the Great, Russia has desired control of the narrows connecting the Black Sea with the Mediterranean. That Russian efforts to secure this control have not been successful has been due largely to British opposition. Turkish control of the highway was satisfactory to Great Britain so long as that control was exercised under British influence. When Turkey entered the war on the side of Britain's enemies conditions changed.

England and France accordingly undertook to gain control of the straits. The nominal reason for the undertaking was that their ally, Russia, whose Black Sea fleet was clearly unequal to the task, might be given unimpeded access to the channels of world commerce and thus be placed in a more favorable position to do her full share in carrying on the war. Probably other reasons, not made public, served to reinforce the nominal one. France naturally desired to maintain and if possible increase her influence in Asia Minor. England no doubt wished to punish Turkish defection by carrying the war into Ottoman territory and also to compel the retention of the best Turkish troops in or near Constantinople because any large and well organized body of such troops not otherwise engaged might seriously threaten British control of Egypt and the short route to India.

The conflicting interests of Great Britain and Russia probably have affected the vigor of the allied operations at the Dardanelles. It may be taken for granted that Russia would not be content with a mere right of passage through the narrows but would desire, if not demand, full and complete possession—something that the British would not be inclined to concede. At any rate the earlier allied efforts were not characterized by vigorous, sustained and increasing pressure.

In the meantime it has become apparent that the Dardanelles cannot be taken by a naval force without the efficient co-operation of a strong land force; and the indications are that the Turks are prepared successfully to defend their capital and the straits against any combined land and naval force likely to be brought against them.

[The Fortifications at the Dardanelles and a Review of the Operations Against Them During the Present War. By P. A. *Svensk Kustartilleritidskrift*, Vol. 2, Parts 2 and 3, '16. 6200 words.]

**DARDANELLES, Operations at the (1915)**

[Enfiladed: Changed Conditions on the (Gallipoli) Peninsula. *Sphere*, Nov 20, '15. 800 words. Illustrated.]

When the British landed on the Gallipoli Peninsula, it was safe for the first month to live in the open under canvas on the beach. The battleships kept down the artillery fire of the Turks. But now the submarine menace has driven off the battleship and the Turks have emplaced 6-inch guns commanding W Beach, and all men and animals have had to be sheltered in dugouts. The first Turkish heavy artillery fire came as a surprise when the beach was piled with stores. The new arrangements had to be made with feverish haste.

[Studies of Coast Defense—The Attack on the Dardanelles. By L. J. Cordeiro, Capt. of Art., Portuguese Army. *Revista de Artilharia*, Dec, '15; Jan, '16. 1250 words. To be continued.]

A political and strategical study of the British naval attack on the Dardanelles, with its relation to other campaigns of the war, based largely on British accounts, and giving the political and strategical aspects of the campaign, and describing actual operations.

**—The Gallipoli Landing**

[The Gurkhas. *The Canadian Military Gazette*, Feb. 22, '16. 1500 words.]

The part given to the 6th Gurkhas in the operations on the Gallipoli Peninsula, when the Chanak Bair Ridge was attacked, was an important one and the reports of this engagement are such that the operations of this unit can be closely followed. At 6:30 a. m. the 6th Gurkhas received orders to reinforce the Australian Brigade which was making a flanking movement in order to attack the ridge from the north. The terrain was such that it was decided to have the regiment swing out to the south and from there make a frontal attack. The advance for the day was to be only to the last of the low hills, where the big climb must begin. There a strong position was to be taken up for the night in order to protect the troops advancing from Anzac. During the night a long line of outposts was, of course, necessary.

The orders for the following day were that the 6th Gurkhas, supported by two battalions of British troops, were to deliver a frontal attack on the Chanak Bair Ridge and reach the ridge at 5:15 a. m. This was impossible, for the ground was so steep and so closely covered with brush that no effort to climb the hill could be made until dawn. At 9:30 a. m. the regiment was within 250 yards of the top, where the forward progress stopped. Terrible losses had been suffered. At 6:30 p. m. the regiment advanced another 100 yards and entrenched on the edge of the ridge.

**DARDANELLES—Continued**

The exact location of this position was known at brigade headquarters below, and the Navy was to bombard the Turkish position from 4:45 to 5:15 a. m. the following morning. Almost all of the men were in the firing line all night and had no opportunity for sleep. The next morning after the bombardment, and at the given signal, the regiment scrambled up the remaining 70 yards of almost perpendicular hill and occupied the Turkish position.

However, it was impossible to maintain the sector of the ridge that had been taken and a retirement to the position of the night before was ordered. At 5:00 p. m. the Turks began a series of counter-attacks, all of which were repulsed. The Turks kept up their firing all night, which resulted in another sleepless night for the Gurkhas. At 11:00 a. m. the next day the enemy appeared in such numbers that a retirement to the foot hills was ordered. This retirement was effected at a slow walk and without the least confusion.

**DEBARKATION**

See

**LANDING OPERATIONS****DECORATIONS AND REWARDS, Military***Australia*

[Rewards for Gallantry and Services in the Field (previous list published in Oct *Jour.*) *Australian Mil. Jour.*, Jan, '16. 14 pages.]

Gives a list of 84 names of those rewarded for gallantry in various ways, the Order of the Bath (10), Most Distinguished Order of Saint Michael and Saint George (13), Victoria Cross (8), Distinguished Service Order (8), Military Cross (6), Brevet (1), Distinguished Conduct Medal (38). The specific deeds of gallantry are recited in all except the first two classes.

**DEMOLITIONS**

[National Defense—For Engineers and Contractor. By Maj. P. S. Bond, C.E., U. S. A. *Engineering Record*, Part 7. Demolition and Siege Operations. Apr 15, '16. 3000 words. 4 photos.]

Demolition is such an important accessory to tactical operations that all troops, and not merely engineers, are now equipped with light and portable demolition outfits. It is important that all officers be fully instructed in handling high explosives.

For military purposes, an explosive should be stable, unaffected by ordinary atmospheric changes, not too sensitive, not unduly difficult to detonate, easy to transport and handle. Of the various explosives in use, dynamite is the most common commercial type, and is well adapted to military uses. Nitro-glycerine is dangerous in handling and transportation. The fulminates are especially useful as detonators for other explosives.

The charge may be fired by means of a powder fuse, time or instantaneous, or preferably by electric current from an exploder. Charges should be tamped whenever practicable to increase their effect; either placed in

bored holes, or covered with mud or earth. The damage inflicted should be sufficient for the purpose and nothing more; it is the engineer's task to decide on the most vulnerable points to attack, the amount of explosive to use, and how to place it. Railroads are particularly vulnerable at their bridges and tunnels; masonry arches should be attacked at the haunch or crown; locks are rendered useless by destroying their gates, etc. Roads are difficult to destroy, but traffic can be blocked by means of trenches dug across them. Timber structures can be destroyed by fire, without necessitating special equipment. Some demolitions can best be executed by large calibered high-explosive shells. Barbed wire entanglements form an obstacle particularly difficult to destroy.

Modern developments have tended to obliterate the sharp distinction between siege and field operations. Important localities, however, are still provided in times of peace with elaborate and powerful "permanent fortifications." An assault against such formidable works, manned and well supplied with munitions of war, has little prospect of success unless the works have first been demolished by the fire of heavy artillery. Hence the more formal procedure of a siege, whereby the defenders are cut off and surrounded by a line of investment, the attackers' guns open their bombardment, the "first parallel" is established and zigzag approaches pushed forward to a second parallel. After successive approaches by sapping, mines are driven forward under the hostile works. Meanwhile, the garrison have opposed these activities with fire, by sorties and by counter-mining. Finally, a breach having been made in the defenders' lines, the besieger delivers an assault from the last parallel, supported by artillery fire. Starvation, bombardment, assault—these are the potent methods of reducing a fortress.

**DENTISTRY, Military**

[The Dental Service in War. By Sylvestre Moreira, Captain Graduate Dentist. *Boletim Mensal do Estado Maior do Exercito*. Feb, '16. 4000 words.]

The European war has demonstrated clearly the absolute necessity of dentists on the field of battle. They can care for wounds of the different parts of the face and head as well as of the mouth.

Because of the conditions under which they are compelled to live on a modern battle field, the exposure to weather conditions, sometimes lack of nourishment, and the absence of means for keeping mouth and teeth clean and in good condition, men are susceptible to various afflictions of the mouth, teeth and gums. Observation has shown that it is impossible for men with toothache, abscesses and other afflictions of the teeth to work, either mentally or physically, as the pain causes terrible nervous depression and destroys energy and activity. The soldier suffering with toothache or dental abscess cannot stand the long hours of strain in the trenches. The modern field of battle demands the maximum degree of physical and moral resistance.



Up to the beginning of the present war dentists were with the hospitals in the rear, but they have been employed even in the first-line trenches and on the battle field with success.

Dental caries is the affliction most frequently encountered in all individuals, the proportion varying from 80 to 100 per cent. depending upon the race and nationality. With thirty-two teeth, each open to attack from five sides, it can readily be understood why the difficulty is so great under conditions where meals are irregular, and poor food and lack of sufficient nourishment frequent. In an army of thousands of soldiers, the number attacked by caries and the consequences thereof are enormous. This was the experience at the beginning of the war. Many men with afflictions of the mouth had to be sent to the rear from the firing line, as they were useless as long as the afflictions lasted. It was after the battle of the Marne that the necessity for dentists at the front became most apparent. Finally a large number of recruits who had been rejected on account of poor teeth were successfully treated by the Dental Corps and were enabled to join the colors.

The Dental Service of the French army, which was created in 1904, seems to be one of the best, but it has undergone many changes since the beginning of the present war. It is well organized with centers to which men can be sent for treatment.

This service comprises the treatment of deformities of the face and the treatment of wounds of the face, and for this purpose there are hospitals in Paris, Lyons, and Bordeaux.

In France it is estimated that there were 60,000 who had been rejected because of poor teeth, but in one month's time 3000 men were given treatment and sent to join the colors.

The British army has a dental service similar to the French. All members of any expeditionary force are carefully examined and treated if necessary before departure. All military hospitals have a dental department. The Royal Dental Hospital of Leicester Square, London, had treated, up to the month of April, 4000 recruits. All expeditionary corps carry with them dentists, whether they are on the firing line or at the bases. The expeditionary force from New Zealand took with it ten dentists.

General Douglas Haig was attacked by a severe toothache one morning at his headquarters in France, and a dentist was immediately summoned from Paris. The automobile of the dentist was struck by three shells and his instruments scattered. He had to proceed on foot, and only reached General Haig's headquarters after encountering many difficulties. Finally the tooth was extracted under a rain of bullets.

The German Army has an admirable dental service and it is well organized. It extends to the first line and is included in the ambulance and hospital service. Each corps of the army has its dental service with all required personnel. In the 4th Corps of the Army, Gen-

eral Hordynsky organized three ambulance companies for dental service, and in three months one of these companies treated 7000 combatants.

The existence of a military dental service in practically all the armies of the world proves the real necessity for this service, whether in peace or war. The *Medicina Militar* of Feb and June, 1911, and Aug, 1913, gives the details of organization in the different countries. Rumania requires the professional services of dentists up to the age of 65. The service was established in Spain as late as 1913.

As far back as 1862, doctors in the Brazilian Army were instructed to learn dentistry. The methods employed were crude. As there was not in Brazil a course in any college embracing the subject, it was introduced in 1884. The course at that time consisted principally in instruction in removing teeth. The statistics since the introduction of military dentists into the army in 1910 proves that this course was justified.

#### —Dental Surgeons

[Dentistry at the Front. *Army and Navy Gazette*. Jan 22, '16. 400 words.]

As showing the completeness of the organization of the French army, a bill is to be brought before the Chamber providing for the incorporation of all qualified dentists and a certain number of dentist mechanics in Red Cross sections, the creation of a corps of one thousand military dentists with a rank of adjutant, and for the employment of the personnel in three grades, at the front, in rest camps, and behind the lines.

#### DESTROYERS

[Destroyers and Their Functions. *Proceedings United States Naval Institute*, Nov-Dec, '15. From N. Y. *Herald*, Oct 22, '15. 300 words.]

Speaking of the work done by destroyers in the present war, the *Herald's* naval correspondent in London states that this type of vessel has proved so valuable that its future is assured. He considers it the primary auxiliary of the fleet, capable of being used for patrol duty, harbor and base defense, and for reconnaissance and convoy service.

Changes in construction and equipment of this type forced by the teachings of the war will be those providing concentrated and superior fire, good displacement and high speed found to be so essential.

#### DIRIGIBLES

[Zeppelin Problems. *Arms and Explosives*, Dec, '15. 900 words. Tables.]

The Zeppelin raid of Oct 13 gave the anti-aircraft defense of London full opportunity, as the Zeppelins were clearly outlined by the searchlights, but they apparently escaped unscathed. The difficulty of combating Zeppelins is not ordinarily appreciated. They fly at altitudes around 10,000 feet at a speed of 60 m. p. h. On the ground, the problem of hitting a target of that size would be simple, but in the sky, even with tracer projectiles, the problem is very difficult, as will be explained in a later article.

**DIRIGIBLES—Continued**

The anti-aircraft artillery can, however, keep the Zeppelins at a great altitude, thus greatly reducing the effectiveness of their operations, as bombs must be dropped more or less at random. The actual path of a bomb of sectional density 2 approaches closely a parabola, but the range to point of fall is considerably influenced both by altitude and sectional density; hence the bomb-dropper has also a difficult problem.

(Tables of horizontal range to fall and time of fall are given for altitudes 3000-10,000 feet and sectional densities 0.5-2.)

[Possibilities of the Large Airship. By A. J. Liversedge. *The Fortnightly Review*, Dec, '15. 5500 words.]

(In this non-technical, popular article, dealing with very broad generalities, the author argues against the general impression that the large airship is a failure. He believes that the despatch, a twelvemonth ago, of an Allied airship to the Balkans would have played a great part for the Entente. And further, that had smaller airships been sent out in sections and set up on sites convenient to the Straits, Constantinople would now be in the possession of the Allies.) That limitations on the use of the large airship exist, is freely admitted, for example, the weather. And one reason why the (German) Zeppelins have done so little, is that on the outbreak of the war the English authorities stopped the publication of the Greenwich daily weather reports. Again, it is a weapon for particular duties, and special occasions [and apparently the duties have not yet defined themselves, nor the occasions arisen.—Ed.] To this must be added the consideration that the large airship is not adapted to the German character. The question therefore is not what the Germans have failed to do, but what the British could have done had they too been equipped with an airship fleet.

The aeroplane can deliver its blow only at a high rate of speed; moreover it can never deliver a series of concentrated heavy all-shattering blows. As experience accumulates, accuracy will be gained. Even in certain kinds of scouting the airship, thanks to its ability to carry a powerful wireless set, will be superior to the aeroplane. Large airships in competent hands could have prevented the fall of Liège, Namur, Antwerp, Maubeuge, and of the great Russian fortresses in the East.

(The article closes with a discussion of the possibility of building an adequate fleet of large airships in England—and concludes in favor of the possibility.)

See also

**AERONAUTICS—BATTLE-PLANES**  
*Germany*

[Aeronautics. Zeppelins Built Since the War. Note. *Scientific American*, Feb 19, '16. 200 words.]

A recent press dispatch from Berne, Switzerland, indicates that there are about eighty Zeppelins in service. The LZ-95 recently made a trial flight, and it showed considerable varia-

tion from ante-bellum design. The craft is plentifully supplied with machine guns and bomb apparatus. Rumor has it that they will play an important part in a possible engagement between the German and British fleets.

[Super-Zeppelins. By Baron Ladislas D'Orcy. Mem. Am. Inst. of Aeronautic Engineers. *Scientific American*, May 13, '16. 3000 words. One illustration, one table.]

The destruction of the Zeppelins LZ-77 and the L-15 and the consequent examinations of their remains give some idea of the latest type of Zeppelin—the super-Zeppelin. It is not known whether a separate smaller type for military purposes exists, but the latest and largest type will be discussed.

The length-diameter ratio, formerly ten to one, has been reduced to eight or nine to one, and is still above the theoretically perfect ratio of six to one for the smoothest air flow. The bow is now blunter and the stern tapered, whereas in earlier types the ends were symmetrical. The LZ-77, a late type as evidenced by the factory number, was about 540 feet long, with a displacement of 1,100,000 cubic feet, giving a lifting power of about 33 tons. The rudders have been simplified and increased in area, and are more efficient due to the tapering stern.

The propelling apparatus comprises one engine in the front car, and three in the rear. The stern mounting has three advantages: (1) the air from the propellers does not interfere; (2) the danger from sparks from the exhaust is minimized; and (3) more room for the navigating personnel in the front car.

The armament has hardly changed and comprises the bomb dropping apparatus in the middle of the gangway, two machine guns in each car, and two on top reached through a chimney by ladder.

Improvements in construction and increased size have increased the useful load to two-fifths of the total lift. On this basis a 33-ton super-Zeppelin carries a useful load of 11½ tons, comprising (say) 2 tons of ammunition, 1½ tons of crew, probably 4 tons of ballast, and 4 tons of fuel.

The crew of 18 men comprises one commander, three helmsmen, one engineer, five mechanics, six men to man the six machine guns, and two men to manage the bomb-dropping apparatus.

The questions of ballast and buoyancy are closely related, but cannot be treated at length. Loss of buoyancy cannot always be compensated by jettisoning ballast. It is possible that the Germans have devised compensating ballonets for each separate gas-bag to counteract the contraction due to increased pressure on descending from high altitudes.

The fuel consumption amounts for four engines to about 450 lbs. per hour, hence fuel is carried for 18 hours at full speed (= 55 knots), thus giving a cruising radius of about 990 nautical miles. It might be possible to somewhat increase this radius by running on two engines on the homeward journey after

being lightened by expenditure of ammunition and fuel. Calculation based on the formula

$$\text{Speed at } X \text{ power} = \frac{\text{Full Speed}}{\sqrt{\frac{\text{Full Power}}{X \text{ power}}}}$$

shows that the cruising radius might be increased to about 1200 nautical miles.

In the late raids, Liverpool and Edinburgh have been visited by Zeppelins coming from the east, hence from some of the "airship-harbors" which dot the German coast from Tondern to Emden. From Tondern to Edinburgh is 440 nautical miles, and from Emden to Liverpool 400 miles, thus verifying the correctness of assumptions regarding the cruising radius. It is possible that the more perilous journey across the North Sea is made instead of the shorter one from Belgium because of the increasing efficiency of the anti-aircraft defenses.

[Dirigibles. Latest Type of Zeppelins. *La Guerra y su Preparación*. May, '16. 350 words.]

From an examination of the dirigible LZ-77 destroyed in France on the 24th of Feb, 1915, the following data have been obtained:

Capacity, 30,000 cubic meters, more or less;  
Framing, aluminum, hardened by an alloy of copper and zinc in small quantities;

Length, 160 meters;

Diameter, unknown;

Form, unsymmetrical, blunt in the bow and tapering off astern;

Gondolas, two, carrying the motors and the machinery for working the rudders, both vertical and horizontal. Between the gondolas is a central cabin for the pilots and crew, and in this cabin are carried bombs and the wireless telegraph members;

Motors, 5 Maybach of 180-200 h.p., with 6 vertical cylinders, 160-170; weight 448 kg., and consuming 230 gr. petroleum per h.p. hour, and 2.5 kg. of oil per motor an hour;

Propellers, 5, two on each side of the body, symmetrically placed, at a third of the length of the dirigible from the bow to the stern. The fifth is mounted astern, behind the second gondola. This arrangement gives very great horizontal velocity and greater ascensional force; under an angle of ascent of 15 degrees, by elevating the bow and throwing out ballast, altitude may be gained at full speed. This is what was done by the Zeppelin that attacked Paris, Jan 7, 1916.

Armament, 1500 kg. of bombs of 50, 80 and 100 kg. respectively. Each bomb is held in place by special hooks, electrically controlled from the cabin. Six machine guns, two in each of the gondolas, the two others on the upper platform, reached from the cabin by a ladder through the Zeppelin passing between two of its 20 ballonets.

[Aeronautical Notes. *Scientific American*, Oct 28, '16. 100 words.]

Lord Montagu recently described a type of super-Zeppelin of which two have been built and four more are building. The principal features are: capacity, 2,000,000 cu. ft.; length, 780 ft.; beam, 80 ft.; and six or seven engines of a total of 15,000 [1500?—Ed.] horse-power. The speed is 80 m. p. h.

#### Great Britain

[A Novel British Airship. By Baron Ladislas d'Orcy. *Scientific American*, June 10, '16. 800 words. Illustrated.]

Fifty rigid and non-rigid airships are in the British construction program of 1915-17. Illustrations show a small non-rigid type, in which an aeroplane fuselage is substituted for the car. Head resistance is cut to a minimum, and a 70 h.p. Renault engine suffices to give a speed of 40 or more miles per hour. The airblower, which compensates for loss of buoyancy, due to variations of temperature and pressure, utilizes the blast ("slip-stream") from the propeller.

#### Spain

[Military Notes. The "Salas" Dirigible. A great Spanish Invention. *Rev. del Circulo Militar*, Aug, '15. 400 words.]

This dirigible carries 15 aeroplane motors. It needs no ballast of any kind and there is no loss of hydrogen on descending.

On a calm day it attains a speed of 130 kilometers per hour. The average velocity is from 80 to 90 kilometers. The model constructed for proof is 195 meters long and has space for 50 passengers.

#### —Rigid

[The Rigid Dirigible. Extract from *Le Figaro*, Paris, Jan 17, '14. *Army & Navy Jour.*, Dec 11, '15. 600 words.]

M. Tourniaire sends the *Army & Navy Journal* an account of the flight of a rigid dirigible over Paris. In his letter of transmittal he states that "the parent idea of the rigid was patented in France in 1873, and the application of it was not made in Germany until 1906. It would be well also, that it should be remembered in England as well as in France, that the construction of units under the rigid system owes nothing to the German Zeppelin, since the idea is that of a Frenchman."

The Spieß is the first rigid dirigible of the French fleet. The inventor, M. Spieß, is an Alsatian whose patents date from 1873.

"The keel of the Spieß is rigid, its sections polygonal. It is divided into compartments in which are lodged the lifting ballonets. It carries two pairs of screws, one forward, one aft. The screws are each three meters in diameter, each actuated by a 180 horsepower motor. The general dimensions of the dirigible are: Capacity, twelve ballonets of 11,200 meters cubical contents; length, 110 meters; cross section at midships, thirteen meters. The peculiarity of the Spieß is that its skeleton, instead of being of a special aluminum like the German dirigibles, is made of cloth-covered hollow wood. A network of steel

## DIRIGIBLES—Continued

wire stays assures rigidity of construction. The reinforced beam thus constructed is very light, very solid, flexible and indeformable. The trials of the Spieß have been followed with great interest. It will be especially useful to record the speed and endurance of this new dirigible."

## —Use of in European War

[The Zeppelin Raids over England. *Sphere*, Nov 13, '15. 600 words. One illustration.]

The latest Zeppelins have many new arrangements; they are capable of a speed of 50 to 70 miles per hour, and carry over a ton of explosive. A new arrangement described is that of passing the warm exhaust of the motors between the inner and outer envelopes, thus enabling the Zeppelins to fly at very high altitudes. Several popular misconceptions concerning the Zeppelins are punctured,—such as that they rise several hundred feet after dropping a bomb weighing 200 lbs. As a matter of fact a 200 lb. bomb makes little difference in a Zeppelin weighing 28 tons, and vertical motion is governed by rudders.

[Progress in Aeronautics. By Major H. Bannermann-Phillips. *United Service Mag.*, Sept, '15. 6000 words.]

An explosion of hydrogen occurred at Wormwood Scrubs on July 28, the cause of which is left in doubt. A number of causes have been suggested, among them that of spontaneous combustion. This latter question has been referred to the best scientists in the country. The risk of conflagration in airships is always present, and it is important for the aviator to know his dangers accurately.

After a temporary cessation, a Zeppelin raid occurred on Aug 9. The difficulty of using aeroplanes against Zeppelins at night is illustrated by the fact that one aviator who went up against this raid was killed upon landing in the dark.

"... The rigid naval airship of the Zeppelin type is a long tubular vessel with sixteen sides, a cylinder with rounded ends, or rather ends of which the frame in section is of elliptical shape, so that they resemble the half of an egg. There is a V-shaped keel enclosing a cabin for stores, explosives, and passengers, added to its undersurface, with two boat-shaped cars hung from points below which serve as floats when it has to travel on a water surface. The framework of the cylinder is therefore so constructed that it lends itself to the process of being towed without undue strain, but extreme care would have to be taken in doing so not to bring a transverse strain to bear at right angles to its length or it would tend to buckle and break up. The frame is composed of sixteen longitudinal girders of trellised metal work, which are held in position paralld to each other by a number of equidistant sixteen-sided polygons or hoops. These again are braced by diagonal stays, in such a manner that the whole cylinder is divided into compartments from back to front. Each compartment con-

tains a gas-bag, and the whole frame has an outer covering of heavy fabric leaving an air-space between the gas-bags and the outer 'skin,' but there is also a network of fibre interposed between the trellis-work and bracing stays and each gas-bag which takes the upward pressure or 'lift' of the latter when filled. The layer of air between gas-containers and outer skin serves to reduce the rate of expansion of hydrogen by the sun's rays by day or the contraction caused by the chill of nightfall, rain, snows, or cold wind. This latter process of air-cooling naturally sets in directly an airship leaves the shelter of its shed and is driven through the air. The division of the hull of the dirigible into a number of compartments has a three-fold purpose: primarily to promote rigidity and keep the longitudinal girders in position; secondly, to distribute any possible leakage over the whole length of the airship; and thirdly, in case of the vessel being tilted up or down longitudinally, to prevent undue pressure of the whole volume of gas at bow or stern on the upper portion of the framework." There are vertical and horizontal rudders for steering. The later Zeppelins have an arrangement for transferring gas from one container to another.

A very sane and reasonable summary of the case for and against large rigid dirigibles for war purposes is given by Mr. Massac Buist in the *Morning Post* of Aug 12, in which the following are the chief points: Although there is talk of the Zeppelin fiasco, Germany's Zeppelins have not proved failures, though eight of these aircraft are known to have been lost to date. It is a question difficult to argue, because the most telling facts may not be cited. Boasts are made by Germans, usually for a purpose, but nothing is known as to the opinion concerning the possibilities of Zeppelins of those Germans who really know. What the Zeppelins have actually done should be noted. Their biggest work has been scouting over the North Sea, in which connection they have proved an absolutely invaluable instrument, despite the distinct limits to their powers of accomplishment at present." They have dropped bombs on Antwerp and London, and they have done this in moonlight and when the nights were short, returning unharmed. Considering the enormous target offered, the disasters have been remarkably few. Of the many Zeppelins that have come to England, not a single one has been destroyed while over England or on the homeward voyage over the open sea. There is but a single authentic case of damage, and that to only one of them. Their greatest danger is of damage when not in use, and several have been destroyed in this manner.

The Zeppelin is only in process of development, a process difficult on account of their great cost. No private individual can afford to experiment with them as is the case in aeroplanes.

Two of the finest of the Zeppelins, the *L-I* and *L-II*, were taken over by the German navy. Both were destroyed by accidents.

The German aeroplane work slackened

notably in the late winter and spring of 1915. Then the inactivity was explained by the appearance of new types of German aeroplanes of greater power and speed. A new 150 h.p. Aviatik appeared on the scene. The new machines are undoubtedly worthy of the admiration and the respect that the French have accorded them. It remains to be seen whether the German airmen have kept pace with the designers.

Quoting from an editorial in the *Aeroplane* of Aug 11, the three types of German aeroplanes are described. The "Fritz" is a biplane of 80 to 120 feet span, with two fuselages each with an engine and tractor screw in front, and a nacelle in the middle with engine and propeller behind. It is reported to carry a semi-automatic gun. Opinions as to speed disagree, but it is apparently very fast with all engines going full power, and all agree that it can climb rapidly, and is a formidable machine. Next are several types of two engined machines with an engine on each wing. They are apparently 80 to 90 feet span, with two 150 h.p. engines giving a speed of about 90 m.p.h. They apparently carry two machine guns, one forward and one aft.

The third type is a machine of 70 foot span with a single big 200 to 250 h.p. Mercedes engine forward, 12 cylinder V-type, made up of two engines set V-fashion on a single crankshaft. This machine is faster than anything the French possess except the racing Morane.

Zeppelin commanders have apparently been ordered to take more risks or more energetic action. Undeterred by the loss already mentioned, a new raid was made on England on Aug 12. There is a probability that one Zeppelin was damaged by the mobile anti-aircraft section.

[Air Raids and Sir Conan Doyle. *Army and Navy Gazette*, Jan 22, '16. 500 words.]

In a letter to the *Times* of Jan 18, Sir Conan Doyle said further Zeppelin raids upon London were to be expected. He pointed out the ease with which aviation centers could be established in France, whence retaliatory raids could be made upon German cities, a plan which would doubtless meet with popular approval. It is doubtful if carrying out these suggestions would serve any military purpose. The people of London should be content to take their chance on the rare occurrence of a raid. Great Britain has not enough aircraft and trained airmen to maintain aviation stations for the sole purpose of preventing raids on London. There are none too many aeroplanes for purely military work at the front. For the moment something of the Allied air supremacy seems to have been lost. The energies of the British aviators should be confined to the destruction of the German army, its material and communications, and should not be diverted to any non-military side issues.

[More Zeppelin Raids. *Independent*, Feb 14, '16. 1000 words.]

The most serious air attack on England yet reported took place on the night of Jan 31. Six or seven Zeppelins passed over the mid-land counties of Norfolk, Lincolnshire, Staffordshire, Suffolk, Leicestershire, and Derbyshire. Some localities were visited twice, and in other cases the Zeppelins remained over one locality for several hours.

Over 300 explosive and incendiary bombs were dropped, resulting in casualties aggregating 59 killed and 101 wounded. All of the Zeppelins escaped.

The Germans justify the raids as being a blow struck at the heart of industrial England. Lord Roseberry's demand for reprisals is echoed generally, but the *Manchester Guardian* on one side and the German Socialist paper *Vorwärts* on the other argue that the raids are futile for military purposes and merely embitter the struggle.

Paris was visited by a Zeppelin on the night of Jan 29, flying above two miles altitude. Thirty aeroplanes went up after it but it escaped and returned the following night. 24 people were killed and 29 people injured by the bombs dropped. The Zeppelin attacks on Paris are stated by the Germans to be in reprisal for aeroplane attacks on Freiburg and other unfortified towns.

[The War in Europe. *Army and Navy Jour.*, Feb 19, '16. 200 words.]

An official statement by the British War Office, Feb 3, gives the casualties in the recent air raids against England as 61 killed and 101 injured. In the future, detailed information will not be made public. The present statement is to show that the damage by these raids will not seriously affect British military resources. In 29 raids since the war began, a total of 266 persons have been killed. No important military or naval establishments have been damaged.

[Bombs in Zeppelin Raid on Paris. *Scientific American*, Mar 18, '16. 100 words.]

In the recent Zeppelin raid on Paris, 40 bombs were dropped, part incendiary and part explosive. Some of these failed to explode, giving an opportunity to examine them. One type was a steel sphere 12½ inches in diameter, with walls 5-16-inch thick, and containing 46 pounds of trinitrotoluene. Another type is 20 inches in diameter and weighs 224 pounds.

[Air Raids Over Great Britain. *Army and Navy Jour.*, Apr 8, '16. 700 words.]

Air raids over Great Britain were made on five successive nights from Mar 31. The first raid on Mar 31 was by five Zeppelins, one of which, the L-15, was brought down in the Thames estuary and the crew captured. The air raid on Apr 1 was participated in by two Zeppelins. On Apr 2, six Zeppelins carried out the most extensive raid yet. Several hundred bombs were dropped. Three of the Zeppelins sailed over Scotland, one over the northwestern counties of England, and two over the eastern counties. German reports claimed damage was done to dock estab-

**DIRIGIBLES—Continued**

lishments on the Firth of Forth, and other military damage elsewhere. These reports are denied by the British.

April 3 only one Zeppelin engaged in raiding. The results of the raid on April 5 have not yet been reported. Mr. Tennant stated, April 4, that the new arrangements for defense against aerial attacks had been very successful, and that more than one attack had been driven off without London knowing anything about them.

[The Wreck of Zeppelin L-20 on the Norwegian Coast. *Sphere*, May 20, '16. 600 words. Illustrated.]

Probably injured by anti-aircraft fire and confused by certain precautions, the L-20 lost her way and barely reached the Norwegian coast. There it first hit the ground and tore away the rear gondola, after which it drifted over the cliff and came down on the waters of Hafsford. The Norwegians came upon the scene and tried to tow it ashore. It broke up, however, and the forward part threatened to go adrift and do possible damage, whereupon it was fired at and blew up. (Illustrations show details of construction of the rear gondola which was torn off when the Zeppelin first struck. The forward gondola was almost entirely closed in.)

[Mastery of the Air vs. Control of the Sea. Zeppelins as Observation Towers for the German Fleet. By Baron Ladislas d'Orcy, M. Am. Inst. Aero Engineers. *Scientific American*, June 17, '16. 3000 words. Illus. Diagram.]

Air power is chiefly a matter of construction, training, and numbers. Great Britain has no rigid airships of great endurance (Zeppelins), and seaplanes cannot perform sea scouting duty satisfactorily. Hence, Germany's fleet has a radius of observation of 80 miles against a 20-mile radius for Great Britain's fleet.

Germany stuck doggedly to airship construction, alone realizing of all the nations the advantage she would thus derive. The type developed is not one that can be duplicated off-hand; hence this advantage will be retained for a time at least. Now Germany is well provided with rigid dirigibles, and the Allies have none.

German official reports lay stress on the results of raids, and are reticent about naval scouting. Possibly the raids were in reality scouting expeditions.

Another field of value in which the Zeppelin is superior to the heavier-than-air machine is in spotting for artillery, particularly in naval engagements. Now that Great Britain has awakened to a realization of the value of Zeppelins, it will be interesting to watch developments in the British bid for air supremacy—and Germany's answer.

See also

**AERONAUTICS—USE OF IN EUROPEAN WAR**  
**JUTLAND, BATTLE OF—DIRIGIBLES IN**

**—Value of Compared with Aeroplanes**

[Zeppelins versus Aeroplanes. *Army and Navy Jour.*, Jan 15, '16. 800 words.]

At a meeting of the Aeronautical Society, T. R. MacMechen, president of the society, said that the Zeppelin was far more effective than is commonly believed. The speed of an aeroplane is in some uses a disadvantage, especially at night. Always on the move, the aeroplane cannot remain stationary and watch. Aeroplanes have invariably lost the Zeppelins over London. The anti-aircraft artillery fire zone which envelops the Zeppelins serves to keep the aeroplanes away.

The Zeppelin is best on the defensive, waiting motionless with guns ready for any aerial foe. Bomb-dropping from Zeppelins is inaccurate, but far more so from aeroplanes. There are indications that when its armament has been improved, the Zeppelin will no longer be confined to night operations.

Fluctuation of buoyancy due to change of temperature is now controlled by using the exhaust through ducts in the space between the inner and outer hulls. Thus the operator can control the temperature, assuring a static gas. If the air-jacket contains nitrogen, it not only insulates the hydrogen from atmospheric effects, but acts as a fire preventive.

Improvement of speed lines has reduced air resistance and almost doubled the fuel endurance. Straining and re-using the motor oil has also served to save weight and thus lengthen the radius of action. Some saving of weight is utilized for increase of power, thus increasing the dynamic lift to 3½ tons, equal to the entire useful load.

For coastal patrol work, a rigid airship of not less than ten tons is best. It can poise for a day or more at one point, remaining on the watch while an aeroplane must remain on the move and exhaust its fuel.

The Zeppelins in their raids over England have inflicted damage of such importance that both England and Italy are engaged in building large rigid airships.

**DIRKS**

See

**INFANTRY—ARMS—KNIVES**

**DISAPPEARING GUNS**

See

**COAST ARTILLERY—MATERIEL—DISAPPEARING GUNS**

**DISCIPLINE**

[Some Points Connected With Discipline. A lecture by the headmaster of Malvern College. Communicated by Major H. B. Hill, R. A. *Jour. Royal Artillery*, Nov, '15. 3000 words.]

The lecture began by quoting as an introduction, in substance the closing sentences of a lecture on Training by Mr. Spencer Wilkinson, Professor of Military History at Oxford, to officers and n. c. o's at Epping. "You may have the best weapons, the latest scientific appliances, the most highly trained officers, but unless all ranks from the highest to the lowest are pervaded with the spirit of discipline, no army can count on being successful. Dis-

cipline means much more than mere obedience. The common life of soldiering educates us all. We must live that life while we are at it and no other. Every army, every unit of that army, is not a machine but a living organism, and if that organism is to carry out its function properly there must be no weak spots."

The secret of all true discipline lies in mutual confidence and trust. To be trusted we must be worthy of trust. To be worthy of trust, we must train ourselves and be trained thoroughly mentally, morally, and physically.

As regards discipline, there are three classes of men: (1) those who enforce discipline naturally; (2) those who have no idea of discipline; (3) those who begin by not knowing how to keep order, but by sheer force of character and perseverance, surmount their difficulties and become quite efficient.

We are not all born disciplinarians, nor can everyone make himself so, but all can do something in that direction. The first thing is to be sure of yourself; speak as if you meant to be obeyed, for a good word of command is an invaluable asset. Acquire ease of delivery and poise, both in lecturing and instructing, as well as in commanding.

You must get to know your men off as well as on parade. This you can do without becoming too familiar. Join in their games and sports when you can.

But one of the most important factors which goes to form the character of the good disciplinarian, is the power of judging character, of understanding men, the possession of that tact which tells how to treat different types of character rightly. Avoid anything approaching favoritism and hold the scales of justice even.

The best results will be obtained by allowing subordinates full liberty of action within certain defined limits, as no military unit can be run by the C. O. alone.

Discipline is built up on drill and detail in which smartness of appearance counts for much.

The idea of discipline may be so misinterpreted as to turn an army into a machine. But there is a happy medium when officers and men are component parts of a living organism, trained not alone to obey the given order but to think for themselves, so that in case of emergency they are capable of deciding and acting on their own responsibilities.

[An Army Strike. *Independent*, Apr 17, '16. 700 words.]

Australia, long "a country without strikes," has not only had labor strikes, but now the "right to strike" has been extended to the army. The recruits in the training camp near Sydney decided that 40 hours of drill a week was an intolerable burden, so they went on strike, seized the railway trains and went to Sydney by the thousands, where followed rioting, which 2000 men on police duty could not control. A regiment of loyal troops,

working first with the bayonet and finally with ball cartridges, quelled the disturbance with one killed and eight wounded.

[Discipline, Orders and Obedience. By Lieutenant J. Murillo, Regiment of Sucre. *Mem. Estado Mayor* (Colombia), July, '16. 750 words.]

(An academic investigation of the words of the title and of the relations connoted by them in the military service.)

[Justice the Foundation of Discipline. By Doctor Teófilo Gatica. *Revista Militar* (Argentina), 9 July, '16. 2900 words.]

Military laws relating to discipline are interpreted in two ways. In the one interpretation the individual man is eliminated as a factor and numbers of men only are considered as an expression of force, the army being regarded as an organization composed of superiors who have the right to command, and of inferiors whose duty it is to obey.

This interpretation prevails in states where the form of government is absolute or despotic. The state is everything, the individual man is nothing, and should be willing to sacrifice himself to the state. Military discipline in such states takes away the liberty and destroys the pride, honor and initiative of the soldier.

In the other interpretation the army is looked upon as an organization of free and equal beings subject only to necessary restrictions that military laws have placed upon their rights as citizens and as men. This is the concept of discipline found in republican or democratic states. Such discipline betters the soldier mentally, morally and physically, enhances his dignity and self respect, and inspires a conscious and deliberate obedience to orders. Soldiers voluntarily submit to it and give the best that there is in them for the good of their country.

Discipline based upon coercion and fear must content itself with a merely passive obedience in which the body obeys mechanically but the soul is absent.

The three basic precepts of right, viz: to live honestly, to injure no one, and to give to each one that which is rightfully his, should animate and inspire all military laws.

These precepts translated into military language signify, 1st, To perform with true military spirit the duties assigned; 2d, To commit no faults against discipline or abuses against subordinates; 3d, To give obedience to superiors, and to respect the dignity and personal rights of subordinates.

Justice and discipline are correlative terms in any democracy. When justice is absent there can be no discipline.

—In Schools

[Scholastic Discipline. By V. M. *Memorial del Ejército*. (Madrid), Oct, '15. 2500 words.]

By *discipline* is meant the rule, order, or method of action or living; and by *subordination* is meant the subjecting of oneself to the discipline imposed by another. In practice these terms are frequently confused. Discipline rests in the action, while subordination

**DISCIPLINE—Continued**

is the constant disposition of mind to submit to discipline. Although both words are more frequently used when speaking militarily, they are applicable to all features of social life.

Scholastic discipline, then, is the rule, order, or method which governs school régime, whether for teachers or pupils.

It is clearly evident that discipline, necessary in all social relations, must be particularly so in the profession of teaching and the art of learning. It comprehends not only the mutually kindly attitude between those concerned, but also includes the exactness of all details, such as punctual attendance, careful attention, etc.

Inattention on the part of pupils, and lack of sympathetic courtesy on the part of either teacher or pupil, render abortive all efforts at instruction. Likewise, failure to attend classes and lack of punctuality lead to disastrous consequences.

Discipline is easy of accomplishment if inculcated in a child from its earliest years, when suggestion and mild correction are in general sufficient. The germs of obedience are thereby sown, and a cultivation of these germs in later years produces the fruit desired.

Unfortunately, it is frequent that this condition is lacking, and that bad habits have taken deep root. Then there are three ways of correction: the example of the teacher, rewards, and punishments. If the first is lacking, the second and third are useless, since nothing can counteract a bad example set by superiors. Conscientious satisfaction and the approval of superiors occupy first place among a pupil's rewards. On the other hand, a thoughtful student's greatest punishment is the disapproval of his teacher and the shame of the position in which he has placed himself.

It is not necessary to defend the punishment system, though its application brings forth differences of opinion as to method. It is undoubted that most persons need correction at times, and the question of severity divides public opinion.

These simple principles of discipline in general, and scholastic discipline in particular, are applicable to military education. This must be directed so as to obtain unconditional subordination at all costs. That an officer is being educated for war must be constantly in mind; and this fact requires an implicit obedience and a disposition on the part of the pupil to comply with the requirements of his full duty, even to the sacrifice of his own ideas of living.

For this, a minute explanation of duties, and an exact knowledge of law and regulation will not suffice. Such information furnishes the basis of the theory of instruction, and is completely sterile if not accompanied by practice.

Correction of faults must be in proportion to their importance and gravity. Those in which the question of subordination does not appear, and those not criminal in aspect,

are to be considered more leniently than cases of deliberate disregard and open violation of the cardinal principles of subordination.

A student in a military school is being educated for command and it is an ancient axiom that he who has not learned to obey can never know how to command.

We are governed on all sides by the immutable law of order and discipline, and nothing in the world may escape its application. The more scrupulous its observance, the greater the results.

**DISEASES**

See also

ASPHYXIATING GASES

EUROPEAN WAR—DISEASES IN

SHELL SHOCK

"TRENCH-FOOT"

TYPHOID

**DOGS**

[Dogs of War. *Independent*, Dec 6, '15. 200 words. Illust.]

One hundred and six famous racing dogs have been purchased in Alaska by the French government for service at the front in Alsace. The dogs are now on their way by steamer to Seattle, and will be transported via Quebec to France. The Alaska dog has long been recognized as a superior draught animal.

—Training for War and Police Duties

[Dogs of War (continuation). By Juan S. de Narváez. *Memo. Estado Mayor* (Colombia), June, '15. 500 words. To be continued.]

Until six months of age, the young dog is lacking in comprehension and should not be punished. By feeding and caressing him, the master should obtain his confidence and affection.

To develop and strengthen his muscles, frequent opportunity should be given to the puppy to play and wrestle with his mates. Future exercises directed toward controlling his will should be conducted in a quiet open space which permits freedom of movement, but offers no place in which the dog could try to hide himself.

**DRILL REGULATIONS**

See

CAVALRY—DRILL REGULATIONS

INFANTRY—DRILL REGULATIONS

**DROMEDARIES**

See

CAMELS

**DUM-DUM BULLETS**

[The Dum-Dum Yarns. By Edward C. Crossman. *United Service Mag.*, Nov, '15. 4000 words.]

The dum-dum bullet is prohibited, but it seems quite in keeping with other methods of warfare in use. Accusations have been made on both sides of the use of dum-dum bullets, but the only satisfactory proof of this use is the capture of such ammunition among the supplies of the belligerents. Wounds, or even the recovered bullets that made them, offer no proof whatever that the bullets before had been prepared in any one of the numerous ways to



make a bullet expand. The wounds themselves are the poorest proof of all.

Except at extreme ranges, it is difficult to stop a modern high power rifle expanding bullet without expanding it, and that expansion destroys the evidence of its expansive character. There are many things that may happen to a regular jacketed bullet that will make it expand. A graze on a sandbag, a ricochet from rock or gravel, may burst the jacket and any ricochet will make the bullet "keyhole."

The principal point is, however, that the modern *spitzer* bullet, with its sharp point and its weight well aft, is in itself as deadly as the regularly prepared dum-dum ammunition. Many big-game hunters can testify to this, and the author's own experience illustrates it. Jack London, writing of Vera Cruz, comments on the very severe wounds inflicted by the U. S. Army bullet.

Whatever the theoretical explanation, the fact is that these sharp pointed, light bullets are erratic in their behavior and inflict slashing wounds of great severity.

One instance is cited of the capture at Maubeuge by the Germans of 60,000 rounds of dum-dum ammunition. But the regular French ammunition has a solid bullet, and the French are less open to accusations than the other belligerents.

The dum-dum stories are told in America in the hope of raising objection to the exportation of ammunition.

## DVINSK

### —Fortifications of

See

FORTIFICATIONS — PERMANENT — EXPERIENCE WITH IN EUROPEAN WAR  
(Article: "A Fortress of Sand")

## EDUCATION, Military

[The Cinematograph and the Phonograph. By Capt. G. Soria. *Rev. del Círculo Militar*, Oct. '15. 2500 words.]

(The author advocates the use of the cinematograph for giving military instruction and of the phonograph for furnishing music along the march.)

[Military Training—Valuable and Valueless. By Capt. Richard Stockton, Jr. 2d Inf., N. G. N. J. *Jour. Mil. Serv. Inst.*, July-Aug. '16. 3500 words.]

At present the nation is in actual danger from the well-meant enthusiasm of the men who plan to "save the day." Millionaires whose military knowledge is in inverse ratio to their money are establishing themselves at the head of volunteer companies, regiments, and even "armies," and there is so much ill-directed enthusiasm in colleges, universities, and summer camps that it is high time that someone should pause and ascertain just what "military training" really is.

The National Guard has assumed that it may be gained by a system of weekly drills supplemented by theoretical schools and a week or more of camp annually. Business men take it to be a matter of a month's "intensive train-

ing." West Point decides that it means years of hard work, and no doubt old army officers will state that it is more than can be fully accomplished in a lifetime.

A reasonable degree of training is such as would make a civilian of real value in time of war, and at the same time add to his worth as a useful citizen in peace.

The ridiculousness of the situation is that legislative committees of every kind assume competency to judge what such training should be; and if these committees are competent to decide, why also are not school boards and every other class of unmilitary civilians competent judges?

The fundamental necessity for military preparation is the development of *men*. In other words, it is the same as the requisite for success in civil life. Having *men*, they should then learn the fundamental characteristics of good soldiering. There is no doubt that our population has declined in general military knowledge since the days when the old muzzle loader hung on every wall. In those days the incidental hardships of a soldier's life were matters of common experience. But even then Washington, as well as other leaders, found that what our armies needed was discipline. Our disasters were due to lack of subordination.

Numerous incidents may be cited of men prominent and successful in civil pursuits who have failed as officers in military and semi-military organizations because they did not understand the essential meaning of the words "discipline" and "subordination."

It is impossible to educate a boy and give him thoro military training at the same time. West Point, Annapolis, and the other military schools of the country do not accomplish this, nor do they claim to do so. They turn out young officers with the best of foundations, a knowledge of "discipline," and these men are developed afterwards in the hard school of experience and in the educational system of the services.

Military training is of unquestioned value. Those who oppose it do not know what it means. It inspires respect for constituted authority, demonstrates the necessity for obedience to law, and makes better and more useful citizens. For the sake of our country we should instill the military fundamentals in our citizens for peace as much as for war; and under proper plans our schools and colleges can do much to impart this training.

[The Fundamentals of Military Service. By Captain Lincoln C. Andrews, U. S. Cavalry. Philadelphia, Lippincott, 1916.]

This book provides interesting and profitable material for the consideration of every citizen, but particularly of the citizen soldier. It is of interest to the average citizen principally because of its broad scope. The author sketches the real military history of the country in so interesting a fashion as to inspire the reader to undertake the more serious study of the subject. The several arms of the service are treated in separate chapters by officers of those branches.

**EDUCATION, Military—Continued**

No man can read this book without gaining a better and fuller appreciation of what military training really is, and how it may be accomplished. It is of still greater value to the National Guardsman. [From *Journal U. S. Artillery*, July-Aug., '16.]

See also

AERONAUTICS—INSTRUCTION AND TRAINING  
 BAYONET—INSTRUCTION AND TRAINING  
 CAVALRY—INSTRUCTION AND TRAINING  
 COAST ARTILLERY—INSTRUCTION AND TRAINING  
 COLLEGES—MILITARY TRAINING IN DISCIPLINE  
 FIELD ARTILLERY—INSTRUCTION AND TRAINING  
 INFANTRY—FIRE—INSTRUCTION AND TRAINING  
 INFANTRY—INSTRUCTION AND TRAINING  
 MUSEUMS, MILITARY  
 OFFICERS—INSTRUCTION AND TRAINING  
 SCHOOLS, MILITARY  
 SANITARY SERVICE—INSTRUCTION AND TRAINING  
 SEARCHLIGHTS—INSTRUCTION IN USE OF  
 SIGNALLING—INSTRUCTION AND TRAINING  
 STAFF COLLEGES  
 VOCABULARY—MILITARY  
 WOUNDED—INSTRUCTION AND TRAINING OF

*Argentina*

[Preparation of Officers and Non-Commissioned Officers. By Major Etchichury. *Revista Militar* (Argentina), Apr., '16. 1100 words.]

Subalterns should be required to solve a military problem or exercise each week. The solutions presented would afford a means of judging in each case the officer's method of arriving at a decision, his ability properly to apply tactical principles, his initiative, his attitude while under responsibility, and the form and quality of his orders. The applicatory method should be used. Problems should be appropriate to the grade of the officers.

The object sought should be to inculcate good troop leading by platoon and section commanders. Non-commissioned officers should be similarly trained and tested. Corporals and sergeants must be prepared to lead sections in combat. In battle they will frequently be required to take over the duties of officers.

*Great Britain*

[Note. *Army & Navy Jour.*, Apr. 8, '16. 300 words.]

Even with the great demand for officers, the British military authorities have refused to promote enlisted men without examination and a special course at a training school. In a report to the War College (U. S.), it is stated that such a school was established in Jan, 1915, near St. Omer, in France. Cadets are selected from enlisted men with necessary educational, physical, and moral qualities, and who are good field soldiers.

The course lasts one month, and is demonstration and practice with a minimum of theory. Each cadet spends 48 hours in the

trenches in connection with observation of artillery fire. Machine guns form an important subject of instruction. Other subjects covered are range finding, siting and construction of trenches, sapping, sketching, night operations, rifle and hand grenades, and co-operation of infantry, artillery, and engineers. 105 cadets are graduated each month.

*Holland*

[*Organ of the Association for the Study of Military Science*, 1915-1916 (Holland). A review of the first fifty years of the history of the association. By J. DeWaal. 39,000 words.]

*Introduction:* Fifty years ago on the 5th of May, 1915, the organization of "The Association for the Study of Military Science" was effected at the Hague, Holland. The management had hoped to observe this fiftieth anniversary and, on that occasion, to present to the members a memoir consisting of articles on the development and progress, during the past half century, in military science, especially on their bearing upon the Army of the Netherlands, the Holland-India Army and the Holland-India Sea Forces, and also upon the Military Operations of the Holland-India Army and the Holland-India Sea Forces, from 1865 to 1915. On account of the mobilization of the army and navy, Aug 1, 1914, and of the war conditions in Europe, it has not been possible to carry out these plans. However, in order that this fiftieth anniversary may not pass by altogether unobserved, a résumé has been prepared and published giving the general history of the organization during the past half century. This is done also in the hope of giving wider publicity to the aims, purposes, and activities of the association.

*The Origin of the Association:* For several years various writers had called attention to the weakness of Holland's military policy. Not acquainted with the conditions and needs, the people and the people's representatives were indifferent to any proposals for increasing the strength and efficiency of the fighting forces. Before changes for the better could be expected, the general public must be informed and enlightened. To accomplish these results, the need was felt of an organization consisting of officers of all branches of the service as well as of the more influential and interested citizens. Through the special efforts of Major P. G. Booms, of the Infantry Staff, and G. F. F. A. Mollinger, of the Regiment of Grenadiers, an organization was effected May 6, 1865, and called "The Association for the Study of Military Science." The organization at once met with favor throughout the country among citizens as well as military men. The membership increased rapidly.

*Regulations:* Following a brief article on the regulations, the purpose of the association is set forth briefly as follows:—

(a) Mutual study of military science.

(b) The spreading of military intelligence.

*Membership:* All officers and retired officers of the land and sea forces, and "non-militarien" who have reached the age of

twenty, are eligible for membership. Their names must be proposed to the management by two members. A two-thirds vote is necessary for an election to membership. Since 1875, the organization consists of ordinary and honorary members. The honorary members consist of princes of royal lineage and of officers who have distinguished themselves in an exceptionally meritorious manner.

**Management:** According to the original regulations, the management consisted of a president, vice-president, a first secretary, a second secretary, and a treasurer. They served for one year but could be re-elected. This regulation was amended, however, in 1866. The amended regulation specifies "that the management should consist of nine members, elected at the annual meeting, these members to determine among themselves who should serve as president, secretary and treasurer. (The names of the officers, who served in these various offices from 1865 to 1915 are given.)"

**Correspondents:** As early as 1866 "a correspondent" was appointed in the Hague for the purpose of keeping the secretary informed of the arrivals and departures of the members of the organization. In 1881 a "chief correspondent" was appointed in Batavia who was to represent the organization in East-India. Each of the larger garrisons like Amsterdam, Breda, and Utrecht, have either one or two correspondents.

**General Meetings:** It was originally specified in the regulations that meetings be held each month from October to April. A subsequent regulation specified that "several meetings" be held during this period. At first these meetings were held at the Hague, but the regulations were so amended that these meetings could be held in any place where at least fifty of the members were stationed. Meetings have been held at the Hague, Amersfoort, Amsterdam, Arnhem, Bergen op Zoom, Breda, and Utrecht.

**Prize Essays:** In 1883, the management was authorized to propose prize-questions on military subjects of practical value. In 1886 the following three questions were submitted for replies:

(a) What military measures must be adopted by Holland to maintain armed neutrality in the event of war between other powers?

(b) How to victual the city of Amsterdam under given circumstances, how to prepare for this in times of peace, and how to carry it out in case of war?

(c) How to effect an organization of the Netherlands-India army that shall be able:—

(1) To defend Java against a European nation?

(2) To maintain our standing and dignity against the various tribes of the interior?

Prizes were awarded to the winners and the best replies to the above questions were published.

**Translations and Reprints:** With a view of providing the members of the association with writings on the more important military questions of the day, an editorial committee, con-

sisting of five members, was appointed in 1892, with instructions to select and arrange, if necessary, for the translation of such articles as they might deem of practical value and to distribute them among the members.

**Organ of the Association:** The publication of "The Organ of the Association for the Study of Military Science" was begun in 1902. Colonel W. C. Nieuwenhuyzen of the Netherlands-India army, was chosen as editor, with a committee consisting of two members to assist him in this work. Following his death in 1913, Reserve Lieutenant Colonel J. C. Van Den Belt, of the General Staff, assumed charge of this work.

**The Annual Scientific Informant:** The publication of this annual was proposed on the occasion of the 40th anniversary of the organization of the association, and the first issue appeared in the month of Apr, 1906. The first three annuals consisted of four hundred pages each, the fourth of five hundred and fifty-two pages, and the next four of five hundred and twenty-six pages each.

**Books and Periodicals.** (Under this caption mention is made of the books received and of the periodicals which constitute the exchange list of the association.)

**The Financial Affairs.** (Under this heading mention is made of the receipts and disbursements of the association, the sources from which these funds were derived and the purpose for which they were expended.)

Following this general survey, ten pages are devoted to "A Detailed Chronological Review of the Association"; six pages to the "Preliminary Articles of the Association"; and ten pages to "The Regulations" as they are now in force. Twenty-seven pages are devoted to a list of the subjects that have been considered at the public gatherings during the past fifty years and to the articles that have been published.

#### —By Lectures

[Engineers Organize Preparedness Lectures under Army Supervision. *Engineering Record*, Feb 5, '16. 500 words.]

The following lectures, to be given at the Engineering Societies Building, New York City, by army engineer officers, are intended to serve as a preliminary to field instruction at engineering camps at Plattsburg next summer.

Feb 14.—Organization and duties of engineers in war; and what engineers in civil life will be called upon to do.

Feb 21.—The service of reconnaissance, including surveying, mapping and sketching, photography and map reproduction.

Feb 28.—Field fortifications, sieges and demolitions.

Mar 6.—Seacoast defenses and battlefield illumination.

Mar 13.—Roads, bridges, ferries and fords.

Mar 20.—Camps and cantonments; general construction, etc.

Mar 27.—Military railways and armored trains.

**EDUCATION, Military—Continued****—Economic Aspects of**

[The Economic Value of Military Training. By Henry C. Emery, Prof. of Economics, Yale Univ. *Infantry Journal*, Feb, '16. 5000 words.]

The problem is important but not fundamental. Economic argument in behalf of military training is not fundamental if some other purpose requires a more extensive military organization. This purpose may be defense from invasion, the maintenance of national honor, the upholding of national pride and prestige, or the protection of weaker republics on this continent.

There is, of course, a perfectly sound economic argument for being prepared for a war possibly necessary to protect our wealth at home or our commerce abroad, but we will not urge that in this paper.

This article is not written to show why we should be prepared, but it is to show the advantage of military training as a preparation for peace. If there is, as is said, no possibility of war for the United States, it might be well to assume its possibility as a means of securing a higher standard of order and efficiency in our domestic affairs. Military preparedness has been opposed on the ground of economic cost. The wastefulness has given grounds for this protest. We must apply brains as well as money to secure more effective results. If a large military establishment makes for greater industrial efficiency, then the money spent is an investment of capital and not a destruction of wealth.

The main argument against preparedness is, however, the great loss of labor power involved by the maintenance of large numbers of men under arms. Two replies to this argument are conclusive. First, it is false to assume that all the labor power of a country is normally utilized to its full capacity. Second, the argument as to labor loss may be met by consideration of the educational effects of military training. Students of German industry are agreed that compulsory military service has contributed largely to increasing the industrial efficiency of the population. Young men taken at a critical age are taught habits of order, cleanliness, discipline, and punctuality, knowledge of sanitation and many arts of production, and are also instructed along many purely educational lines. Germany's productive efficiency has been increased to a far greater degree by having these vigorous, self-reliant men turned back into industry, and the seeming temporary loss of labor force and the actual money expenditure are more than offset. Similar military training for say one year is desirable for the United States from the economic as well as the military point of view. This period means but little individual sacrifice, in spite of arguments to the contrary. At 19-21 years, social and domestic responsibilities are least; this period is not the period of greatest productivity; and further it may be urged that in many cases the year which under a system of general service would be devoted to rigid training might

otherwise be wasted or lost. It is possible that this year at this age would take up the slack of idleness which is frequently to be found preceding a man's entry into the serious walks of life. An American characteristic, true of rich as of poor, is the absence of orderliness and discipline. Is not the discipline and the training of military service the quickest and most effective method of securing these desirable qualities? One notices the lack of responsibility and accountability in college students even, and they are assumed to be engaged upon the serious things of life. They should have training in doing set duties, day in and day out, regardless of weather, personal feeling, or minor aches and pains, to develop stamina, responsibility, and a higher conception of the power of the individual in the community.

A recent editorial states truly that to be a blessing, personal liberty must go hand in hand with personal discipline, and that the chief test of individual freedom is its capacity for self-subordination. The display of this capacity makes republican France glorious today; the absence of it causes men to shake their heads over England's future. Self discipline is not an American virtue of today, and the inestimable value of 4,000,000 men, from dudes to dockhands, reabsorbed into our daily life after learning that obedience is not humiliation and that self discipline is self respect, is only commensurate with the incalculable loss of everything man holds dear, should we to fail to see our destiny. Militarism should not be confounded with universal military service. It is a frequent error. Mere numbers of men can not change our civilian character. We will always place civil authority above military authority. Read Lincoln's immortal letter to Hooker and ask, if you care, who was the Commander in Chief. Ten million men would have made no change. Where is our loyalty to personal liberty, equal rights, and individual freedom, if we fear mere military training?

**—In Schools and Colleges**

[Military and Physical Training in Public Schools. Address to the Convention of the National Guard Association, Nov. 11, 1915. By Brig. Gen. A. L. Mills, U. S. Army. *Infantry Jour.*, Jan, '16. 2500 words.]

This is one of the important methods by which we shall secure an adequate national defense. It is slowly becoming evident to the nation that a necessity exists for a more consistent development of our military resources. The freedom of the individual, which is the keynote of our institutions, has for its indispensable counterpart the duty to the state which guarantees that freedom. Our relative isolation has acted to develop this freedom of the individual and to minimize the duty to the state. The state stands or falls according to our conception of the duties we owe to it.

The various means of training now in force are fragmentary, since uncoordinated and based upon individual and not state initiative. This state of affairs can be remedied by a clos-

er relationship between the National Guard and the public school. Both are state institutions. Congress has no legislative or executive power to institute this training. The state has both, and the necessary steps are much more feasible of initiation by the state authorities than by the federal government. The Adjutant General of each state should indicate the steps needed to organize and standardize military instruction in the public schools.

Military training does not mean the carrying of a rifle and a pack. It means the instilling of discipline, the development of physique and manliness, manliness with all this term means—honesty, truthfulness and self respect. It is an ethical-physical military system for training boys. Ethically, the honor system should be introduced as far as its meanings can be grasped; physically, the proper position, carriage, gait, and physical habits should be inculcated; military obedience, i.e., a willing not a forced obedience, and precision in action and thought should be instilled. These are the first steps. Children should be taught to sit, stand, and walk correctly, to develop self control, to practice their muscles, to concentrate and to develop mental alertness. This instruction should last until the age of fourteen, when military drills should be begun without arms or equipment. Personal hygiene is to be taught now, also the true history of our country, with stress upon our military history. At 16, rifles should be issued to the physically capable. Work can also be given in gallery and range practice, if practicable.

Interest should be sustained and *esprit de corps* fostered by competitions. The State of Wyoming has taken an advanced position in its school training. In historical instruction at this age the extravagant expenditure of life and wealth in our wars should not be concealed. False patriotism is induced by false histories, and our future electors and citizens deserve at our hands the truth.

For later instruction, special courses in military and physical training and military history can be made a part of the curriculum at normal schools. Services of officers and non-commissioned officers from the regular service and the national guard can be utilized. If we neglect the training of our youth, we cannot expect them to be responsive to the call of duty in time of dire need.

[Technical Students Should Receive Military Instruction. By Wharton Clay. *Engineering Record*, Feb 5, '16. 1000 words.]

Modern warfare has resolved itself into an engineering task, and the civilian with engineering training will be the most useful recruit in a volunteer army. This plan has been devised to give technical college students an insight into military engineering without any sacrifice on the student's part, and at no great expense to the government.

The students who so elect should be privileged to absent themselves from college for one semester and join a student regiment, at some unused army post, officered by regular officers. Here they would receive a six

months' intensive training, including military engineering, strategy, sanitation, and communication, all under strict discipline, and including an extended maneuver. Cadets could specialize with the co-operation of their college, in the departments of army affairs already chosen for their civilian pursuits; for instance, the railroad engineer would study transportation with reference to mobilization and handling supplies. The college would give the student one semester's credit toward graduation, omitting from the course an equivalent number of subjects usually required. The government would merely maintain the student during his training, and give him regular army pay,—thus entailing no greater expense than the instruction of an equal number of recruits.

Much could be accomplished in six months' training devoted solely to military pursuits, with pupils of such aptness. In comparing this with a West Point training, it must be remembered that the mathematics, science, and language work of the West Point course would be covered by these students in their college course. Moreover, aside from considerations of national defense, would not graduates with six months of army training and discipline be of increased value to the engineering profession?

[The Colleges and the Naval Academy: A Comparative Study by A. F. Westcott, Ph.D., Instructor, U. S. N. A. *United States Naval Institute Proceedings*, Jan-Feb, '16. 3000 words.]

Many civilian educators have recognized the high quality of military education, and have speculated as to the possibility of adapting military methods to civil schools. Among these are included Professor Phelps of Yale, Professor Brander Matthews, and President Butler of Columbia. In his latest annual report President Butler, discussing the question of physical requirements for all students seeking to enter Columbia, called attention to the benefits of such requirements at West Point and Annapolis.

The obvious objection to President Butler's proposal brings out the handicaps of the colleges as compared to the government academies. The first chief difference is that the colleges must grind whatever grist comes to their mill, while the men who enter West Point and Annapolis are a picked body.

A second distinction is found at the other end of the course, in the prospects held out to those who get through. In the past the colleges have taken no particular pains to guide their students to the work for which they are best suited, but leaves them to choose as they will and turns them out at graduation to make their own way. It is a weakness of the college that it cannot make its students feel that conduct and character as shown in college will really affect their after life. On the other hand every cadet and midshipman is promised a life work if he finishes the course, and they are made to understand that efficiency, conduct, etc., will have an effect on their later promotion.

**EDUCATION, Military—Continued**

Still another fundamental difference is found in the fact that in colleges the training is primarily intellectual, and that social, moral and, to some extent, physical training are not under direct faculty guidance and are not equally shared by all the students, but at the academies all of these matters are under the strict supervision of authority.

[Note. *Army & Navy Jour.*, June 10, '16. 150 words.]

A military training camp for instructors of schoolboys will be conducted at Peekskill, Aug 9 to Sept 9. A battalion of 300 instructors in physical training and athletics, teachers and principals of New York public schools, will receive military training to fit them to instruct high school students under the provisions of the new state law.

[Military Education in the Schools. By Colonel Rafael A. Puente, Ecuadorean Army, *Revista Militar del Estado Mayor General*, Quito, June, '16. 3000 words.]

This discussion by Col. Puente has for its theme the idea that in the present stage of civilization, the most advanced people ought to be, at one and the same time, the most anxious for peace and the readiest for war. Ecuador must solve big problems with its neighbors, north and south, and though no danger threatens at present, it is well to be prepared. It could not, of course, maintain in times of peace a permanent army of sufficient size to carry on a war, and it is too late to begin training the necessary men after the danger has appeared.

How, then, can these men be trained in time of peace? By a judicious combination in all the civil schools, of general and military education. In addition to the physical benefits derived from military training in public and higher schools, the youth of the land would have instilled in their minds early in life the habit of strict obedience to a proper and lawful superior, and would also receive valuable preliminary military training.

In the establishment of this system in the schools and colleges, three or four hours could be devoted to the study of purely military subjects. To accomplish this, the school courses could be modified or certain unnecessary studies omitted. Under this scheme, a young man who spends three years in the university and eight years in preparation for it, will receive some thousand hours of military instruction, which, spread over a rather long period, will be easily digested by the student. On graduating, he would know something of the profession of arms and would be familiar with simple tactical principles and the elements of fortification. The men most suitable as instructors in this work will be army officers.

The same general plan should also be introduced into the lower schools, for the education of many is confined to such schools, where they receive instruction only in Arithmetic, Drawing, History, Geography, etc.

Many soldiers have received no more education than this; some none at all.

If the younger boys are not given any special military training they should at least receive physical drill and should understand the relation of the army to other institutions of the country. They should be familiar with the different military and territorial divisions, the different tactical units of the armed force, the mode of fighting in each arm, and the theory of target practice and shooting. Above all, they should have impressed upon them the idea of universal military service and just what compliance with that duty means. These young men, even if they never passed to any of the higher schools, would, upon entering the army later in life, already be in possession of valuable military training.

See also

COAST ARTILLERY—INSTRUCTION AND TRAINING—IN SCHOOLS AND COLLEGES

**EKATERINA HARBOR**

[Russia's New Ice-Free Port in the Arctic. *Sphere*, Dec 11, '15. 600 words. Two outline maps.]

Russia has been in great need of an efficient and reliable means of communication with the outside world. She had (1) the Archangel route, closed by ice from October till May, extended a few weeks by the use of powerful ice breakers; (2) the Trans-Siberian Railway, which is useless for rapid transit of supplies; and (3) the Nirvik-Tornea route, which involves reshipment at the head of the Gulf of Bothnia.

Ekaterina Harbor, 200 miles east of North Cape, Norway, has been connected with Petrograd by a double track railway to obviate the difficulties of the other routes. Due to the Gulf Stream, this port is ice free all the year, and it is an excellent, well-sheltered, deep harbor.

The work of building the railroad has been pushed with the greatest energy. Thousands of men have been engaged, and construction has been pushed from both ends. In September this triumph of modern engineering was announced as completed three weeks ahead of time, an average of 100 miles of double track railroad completed each month having been maintained. The rolling stock will probably be largely American.

[The Port of the Midnight Sun. *Independent*, May 22, '16. 1000 words. Map.]

(Refers to the difficulty of Russia in communicating with her allies by way of Archangel and Vladivostok.)

Ekaterina Harbor is 700 miles from Petrograd. A double track railroad is being built as rapidly as possible, and is reported open for traffic. It appears, however, that a stretch from Kandelax to Kem, on the White Sea, is not yet completed and here transportation is dependent upon boats. Much of the line is marshy and required construction on pile trestles. Most of the rolling stock is American. Nearly a hundred vessels are waiting in the White Sea for the ice to melt so that they can be unloaded.

**ELECTRICITY****—In War**

[Electricity in Present Day Warfare. *Scientific American*, Dec 4, '15. 2000 words. Illustrated.]

(A popular article describing the use of the pocket flash light in the trenches, the searchlight, microphones for listening for aircraft and submarines, the use of the telephone, telegraph and field buzzer, wireless telegraphy, and the use of X-ray apparatus in military surgery. The use of high voltage electricity for charging conductors used as an obstacle is also mentioned. This has had more application in prison camps than at the front.)

**EMBARKATION**

See

LANDING OPERATIONS

**EMERGENCY RATION**

See

RATIONS—EMERGENCY RATION

**ENCAMPMENTS**

See

CAMPS

**ENGINEERS**

See also

CEMENT

WATER SUPPLY

*United States*

[Note. *Army and Navy Jour.*, Apr 15, '16. 400 words.]

Before the House Committee on Military Affairs, Gen. Black, Chief of Engineers, stated that insufficient instruction was being given in the army in the use of intrenching tools, and in the use of searchlights, and that the engineers had not had much experience in pontoon bridge work. Work on military maps had been neglected. When a map of an area at Charleston, S. C., was needed, it was found that there was none later than 1863. This need of map work is being rectified.

**—Engineering Construction—Computations**

[Rapid Calculation of Cross-sections of Beams Subjected to Longitudinal and Transverse Stresses. By Giuseppe Masciarucci, Major of Artillery. *Rivista di Artiglieria e Genio*, Apr, '16. 2500 words. Illustrations. Tables.]

(This is a mathematical discussion consisting largely of equations, tables and illustrations, and dealing with the dimensions of T-irons and angle-irons subjected simultaneously to both longitudinal and transverse stresses. The results are in the form of tables from which the standard sizes require to meet given conditions of loading may be taken.)

**—Field Operations**

[National Defense—For Engineer and Contractor. By Major P. S. Bond, Corps of Engineers, U. S. A. *Engineering Record*, Mar 4, '16, et seq.]

(Part I. General. Mar 4, '16. 4500 words, 3 photos.)

The principal problem confronting the nation to-day is that of preparedness for defense. Our people are awakening from their sense of false security to a realization that war, which is destruction endowed with judgment and perception, prefers deliberately to select the uninsured. That state is best prepared which can most rapidly bring to bear its resources in men and materials; such resources in themselves do not constitute military strength.

In contrast with the efficient systems of European continental powers, the defects of our own military policy are most glaring. To repel possible attacks, the General Staff recommends 500,000 men at the outbreak of war, 500,000 men 90 days thereafter, and 500,000 men to replace casualties. In all, we might at present muster for a field army, in case of invasion, 125,000 men, many of whom would be only partially trained.

The force contemplated by the General Staff would necessitate auxiliary engineer troops to the number of at least 50,000 men and 1500 officers; our present regular and national guard engineer organizations would account for not over 6000 men and 330 officers. Under our present system it is essential that we provide for a large reserve of at least partially trained men, of whom the officers are the chief concern. The engineer officer must be physically fit, zealous, and resourceful; a competent and experienced engineer as well as a trained and disciplined soldier.

Of all peaceful arts that contribute the results of their research and practice to the successful prosecution of war, none is of more vital importance than engineering. The duty of the military engineer is to plan and execute all works of an engineering nature that are connected with the operations of an army. Military engineering, however, in contrast with civil practice, is characterized by makeshifts and temporary expedients. The military engineer builds not for posterity, but for the exigencies of the moment. He must possess, moreover, a thorough knowledge of the art of warfare, foreseeing the needs of the army and building so as to meet those needs.

[Part 2. Special Duties and Equipment of Engineer Troops. Mar 11, '16. 4400 words, 2 photos.]

Duty with the mobile army is the prime function of engineer troops, and the one on which their organization, training, and equipment should primarily be based. All other engineering duties must be regarded as special, and performed by other troops or civilians, leaving the engineers free for work at the front. Here their duties will fall roughly into three classes:

(1) Operations to facilitate the rapid movement of troops.

(2) Operations to increase the offensive or defensive powers of troops, and to limit those of the enemy.

(3) Operations to maintain the health and comfort of troops.

**ENGINEERS—Continued**

In our service, the specialization common in some European armies is wisely avoided. Except for the communication and aerial work of the Signal Corps, the engineers are trained to execute all technical field operations, an entirely feasible arrangement.

In the economics of military engineering, *time*, and not *cost*, is the primary consideration. The rough and ready makeshifts which serve their purpose are the triumphs of the military engineer's art. High speed in construction is often demanded, at the sacrifice of money, property, and even life. This requisite of speed evidently necessitates the most careful planning and skillful organization. Every essential detail must be foreseen, every need of plant or material provided for, the men spurred to their utmost endeavor.

In regard to equipment, it should not be forgotten that mobility is a prime requisite, and the engineers must not be hampered in their movements by an unnecessarily elaborate equipment. For this reason, there is little place at the front for heavy plant, especially since there is ordinarily no dearth of manual labor. Tools for pioneer work, like the structures built therewith, should be of the simplest character. The same considerations also make evident the economic necessity for utilizing to the greatest possible extent the construction materials—earth, timber, brush, gravel, etc.—which are available at the site.

(Here follows a list of the tools and equipment recommended for the engineer company.)

The development of the motor truck will greatly increase the efficiency of engineer troops, affording more rapid transportation facilities, and making possible the use of small, compact gasoline power plants.

[Part 3. Stream Crossings. Mar 18, '16. 300 words. 6 photos., 3 figs.]

The ability to cross streams is essential to the mobility of an army. Hence all modern armies carry some form of portable bridge with floating supports, or ponton equipage. (Here follows a description of the bridge equipage of the U. S. Army.)

The ponton equipage, reliable as it is, cannot entirely obviate the necessity for hastily constructed and improvised "bridges of circumstance." The most common type is the simple two-legged trestle, with spans of from 10 to 15 feet; three-legged and four-legged trestles are also used. Cross-bracing is always necessary; high trestles may be built in stories; almost any material may be utilized. In considerable depths with a soft bottom, pile trestles are often to be preferred.

The use of trusses will usually be limited to situations where they can be placed with the aid of animals and tackle, and without false work. The usual forms will be the simple king-post and queen-post, (with tension members of iron rod or steel cable), small Howe and Pratt trusses, and lattice girders of plank spiked together. Their span

is ordinarily limited to about 40 feet. In many situations the spar lock bridge, practicable in double lock up to 45 feet, may be preferable to a trussed type.

With moderate loads, the suspension bridge is practicable for long spans. The cable, which is the essential part, should not be over 1 inch in size. The towers will usually be of timber, and of the saw-horse trestle type; for anchorages, dead-men, trees, or ledges of rock may be utilized, slings may be improvised from almost any material. Oscillations and undulations must be guarded against by sway-bracing, guys, etc.

A combination of types of bridges is often the best solution. Wagon bridges should be 12 feet in width. Planking  $1\frac{1}{2}$  in. or more in thickness makes the best deck. Fastenings are of the simplest nature,—lashings, spikes, and bolts.

There is sometimes a strong tendency to resort to bridging when a careful search would locate a practicable ford. The limiting depths of a ford are: for infantry, 3 to 4 ft.; for cavalry, 4 to 5 ft.; for artillery or wagons,  $2\frac{1}{2}$  ft.

Ferries will be used, when bridging or fording is impracticable, especially in the case of wide crossings for only a few troops. In the absence of the ponton equipage, which is suitable for the ferriage of troops, rafts can be improvised from logs, casks, timber, etc. A swift current may be utilized to furnish the motive power for propelling a raft across the stream, when held at an angle with the current and attached either to a sheer-line (trail-ferry) or anchored so as to swing on the arc of a large circle (flying-ferry).

[Part 4. Field Fortifications. Mar 25, '16. 4000 words. 8 photos. 3 figs.]

Field fortification is the most important and distinctively military branch of field engineering, and constitutes an art in itself. The immediate purpose of field fortifications is to increase the resisting power of the troops occupying them. They thus strengthen the defense; even a successful assailant, however, must halt at times, and the ground won with the rifle must be held with the spade. Most field works will be constructed by the troops who are to occupy them; the engineers, however, will be constantly called upon for assistance as to location and details, and for the execution of some of the more difficult tasks.

The first requirement of a defensive position is that it shall be one which the enemy must attack to accomplish his mission. Other more or less requisite characteristics of a good position are: a clear field of fire, (obsolete—Ed.) concealment, secure flanks, good communications, facilities for advance or retreat, etc.

The principal feature of field fortifications is the simple standing rifle trench, with earth parapet. The crest of this parapet will be ordinarily from 9 to 18 in. above the ground, high enough to afford a view of the foreground, but no higher than necessary for this purpose; a 3 ft. thickness is required to re-



sist rifle or shrapnel bullets. Head cover may be advantageously provided by placing in the parapet loopholes of plank, sand-bags, steel-plates, etc. Overhead cover, consisting of a shelf of plank covered with earth, is of more limited application. In the typical narrow trench with steep side slopes, revetment is often necessary, the most common forms being of plank, woven hurdles, sand-bags, fascines, and the like. Traverses are commonly provided at intervals of one or two squads, to localize the effect of bursting shells, and to furnish protection from enfilade fire. Bomb-proof shelters are often incorporated in the fire-trenches by excavating under the parapet. The question of drainage requires careful provision.

The vital element of *concealment* requires that trenches be blended as skillfully as possible with the existing natural and artificial features of the terrain. If possible, they should be kept off the sky-line. Standing crops, ridges and ravines, trees, hedges, fences, etc., lend themselves to this concealment and should be utilized to the utmost. Trenches can thus sometimes be made indistinguishable at a distance of 100 ft.

For the supports, natural cover, if available within a reasonable distance, is to be preferred. Cover trenches, if they must be built, are usually very deep and narrow, and may be roofed over. Communicating trenches allow a safe passage between these support trenches and the firing line. In a position occupied for some time, such hasty fortifications are gradually developed into elaborate siege works.

Subterranean attack, long characteristic of siege operations, may also be an important feature of modern trench warfare. It is characterized by sinking shafts, driving galleries, and exploding mines under the enemy's intrenchments. Protection against this mode of warfare is had by means of listening galleries, and by counter-mining.

The "preparation of the foreground" has for its object the clearing of the field of fire, and the embarrassment of the movements of the enemy by means of obstacles. The most effective obstacle is a belt of barbed wire, strung on posts, and placed close in front of the trenches under effective fire. Other favorite forms include abattis or slashings of trees, palisades, pits, wire fences, chevaux-de-frise, military mines, and the like. As with the trenches, great care should be taken to conceal these obstacles.

Battlefield illumination at night by flares and searchlights, emplacements for machine guns and artillery—these also have a place under the subject of field fortifications. The details of all works must be simple, and experience has resulted in the development of certain type plans. The application of these principles under any given circumstances, however, is no simple task, and demands in a superlative degree judgment, skill, and experience on the part of the engineer.

(The figures include a contoured sketch showing the location of trenches for a regi-

ment of infantry, with a discussion of the principles involved.)

[The Work of the R.E. in the Field. By Lieut. G. C. Martin, V.C., D.S.O., R.E. A lecture delivered at the Royal Artillery Institution, Woolwich, Apr 6, '16. *Jour. Royal Artillery*, July, '16. 5000 words.]

(Note. On account of the value of this article, it is quoted in full, omitting only the introduction and thanking of the lecturer.—Ed.)

The title of the lecture embraces such a wide range of subjects, that perhaps it would have been better if I had placed the word "some" before it, as "Some of the work of the R.E. in the field" would probably have been a more suitable title. For it is obviously impossible to give even the most sketchy account of all the different branches of R.E. work in this war.

So I have been compelled to neglect several most important branches of our work, to touch lightly on others, and to enter into details of one or two only. My choice has been made firstly in those in which I have had personal experience at the Front, secondly, in those on whose work I have been able to obtain first-hand information, and finally in those which are thought to be of most general interest to you.

I am afraid I have nothing to say this afternoon which would be of use to artillery officers from a technical point of view, except emphasizing the importance of all branches of our army having a general knowledge of the work of other branches. In your corps many officers hold, or will hold, certain staff appointments in which the employment of the R.E. plays an important point, and to such I hope this lecture may be of use in helping them to arrive at the best solution of that always much debated problem—"The most efficient method of employing the Royal Engineers in the Field."

Many of the old ideas on the legitimate work of the R.E. in the field have now become obsolete, and when I come to deal with the work of the R.E. Field Companies I hope to be able to show how the new conditions of warfare have brought out new ideas, and how these ideas are best applied.

It will be interesting to consider for a moment the organization of the R.E. before war was declared, as we can then see where this organization failed under the new conditions of trench-warfare and what changes were necessary to enable it to meet and overcome these conditions.

The R.E. with the original British Expeditionary Force were divided into 2 classes:

1. Divisional Engineers, under which was allotted for each division—
  - 2 Field Companies and
  - 1 Signal Company.
2. Engineer Units on Lines of Communication, comprising
  - Fortress Companies.
  - Works Company.

**ENGINEERS—Continued**

Railway Company.

Signal Companies.

Printing Company.

I propose to run shortly thru the work done by some of these units.

The *Works Company* was intended for work at the base, but owing to our numerous bases it was split up into sections—one being at each base.

Assisted by French civilian-labor contractors and working parties from any infantry available, they were responsible for the complete erection of the base camps, and all work in connection with them such as water supply, drainage, lighting, sanitary arrangements, and road making.

They had also, at the same time, to provide store accommodation for the large quantity of supplies and ordnance stores which were arriving, the work for the most part being adapting existing buildings and sheds to meet the requirements of those concerned—sometimes very difficult work.

Their function at present is mainly the upkeep of the base camps which are now run more or less on the lines of any town at home having its own organized engineer staff.

The *Fortress Companies* did not come into active use until the Aisne, and from that time their work was essentially connected with that of the field companies. When the new armies were formed army troop companies took the place of the fortress companies, and the latter name is no longer used.

These *Army Troop Companies* can be placed at the disposal of the chief engineers of the different corps, and their rôle is to assist the field companies in the construction of the defensive lines. They have been employed for the greater part on the second line trenches and strong points.

The Signal Service may be roughly divided into two parts: first, communications in rear of division headquarters, and, second, those in advance of division headquarters.

In the rear of the various division headquarters the majority of lines are of a semi-permanent nature, and the system is not unlike that employed in post offices. All the instruments used are similar to those in use in post offices at home. At the headquarters of armies and at the bases, high power instruments are being employed, such as the Wheatstone Automatic, which can send telegrams at a speed of from 200 to 600 words per minute.

In advance of division headquarters, a very highly trained personnel is required, as great mobility is essential. Cable can be laid from a cable wagon with horses going at a hard canter, and can be picked up at the same pace. During the retreat from Mons, communication during the day was almost entirely by motor-cyclist, but as soon as units went into billets, cables were laid from division headquarters to brigades each night, and again from brigade headquarters to battalions. This cable was picked up again before moving off each morning (usually about 3 a. m.) and I know

of one division which only lost 5 miles of cable in the whole of the retreat.

About six years ago, the whole of the Signal Service was reorganized, and when the war broke out it was hardly out of the experimental stage. The enormous importance of good communication has been recognized by all commands, and the personnel of the companies has been considerably augmented since the beginning of the war. The use of telephones for conversation between actual commanders was found almost indispensable, altho early in the war practically all work was done by telegraph only. At the present time within a division there is a duplicate set of lines so that telegraphy and telephony is kept quite distinct. Each division has its own telephone exchanges, and at a division headquarters there may be as many as 20 different lines to one exchange.

The greatest test to which the communications within a division are put is in the attack, and several alternate lines are always laid to ensure perfect communication.

We now come to the *Field Companies* with whose work I am mainly going to deal this afternoon. The brunt of the engineering work in this war has fallen on these units, and the work accomplished by them includes almost every branch of engineering.

I should like to run briefly thru the work performed by the field companies in the early part of the war, up to the end of October, 1914, when trench warfare commenced.

I think the easiest way to deal with the subject is to follow the movements of our troops, and see what engineering work was carried out during the retreat from Mons and the advance to the Aisne.

At Mons on Saturday, Aug 22, and the next morning, the R.E. had their first experience of assisting the infantry in the preparation of a position for defense. The R.E. work consisted of giving advice as to the siting of trenches and then putting any special points such as a farm, or small village, into a state of defense. The shortage of tools was very noticeable at this period, and much time was spent in collecting all available types of shovels and spades from the neighboring district.

Late in the morning, on Sunday, an order came to the C.R.E. that the bridges over the Mons Canal had to be demolished. Eight sections consisting of a subaltern, 20 men and one tool cart set out for the bridges as fast as possible. Unfortunately, the distance to the bridges varied, those close at hand were successfully destroyed, those at a distance were in the hands of the Germans when the R.E. arrived, but at the intermediate bridges the Germans arrived when the sappers were at work—two sections were missing, one being entirely wiped out.

This brings up a most important point, and that is, everyone must grasp the fact that R.E. work takes time. To demolish a bridge is not the work of a minute, but may take three or four hours, the time depending on the construction of the bridge. Until this fact is realized orders will still come in at the last moment which, if a successful result is to be

attained, should have arrived two or three hours earlier.

Turning from engineering work for a moment, we come to a very different rôle sometimes played by the R.E., that is—infantry work.

On one occasion most of the sappers were put into the firing line alongside the infantry, and many instances of the same kind occur from time to time.

This, again, brings up another important point. Is it worth while using up your sappers as infantry? The answer is unquestionably "No," for it is absolutely essential to have the sappers available *after* the fight to assist in consolidating the new positions taken up. Of course, there are occasions where in the last resort the R.E. had to be called upon to act as infantry, but it should only be done as a last extremity, and then only under orders from the divisional commander.

When the advance commenced, the nature of the R.E. work changed. From "destruction" we now turned to "construction"—engineer reconnaissance of roads—river crossings—demolished bridges—and fortified positions formed the bulk of the R.E. work, and when the Aisne was reached, the sappers had their first opportunity of bridging on a large scale.

The River Aisne had a mean width of about 170 feet, and a depth of about 15 feet. Five permanent bridges which had been demolished were at once made passable for infantry in single file, and later repaired to take mechanical transport.

When one reads of bridge building, one's thoughts at once go to pontoons, girders, and other types of bridging; but from the sapper's point of view the actual construction of the bridge is the simplest portion of the task,—the real hard work beginning when the approaches are commenced.

To make a satisfactory approach to one of the bridges over the Aisne, a road of about 200 yards in length had to be made. This necessitated collecting brushwood for the construction of over 2000 fascines, their transport to the site of the bridge, and the collection of all available road metal in the neighborhood.

During this short period one great defect in our organization—a defect which the corps had long recognized and which they had endeavored to rectify without success—became so apparent that in October the necessary change was made and a 3d field company added to the divisional engineers.

Up to this time the two field companies had to distribute themselves between three brigades. The closest co-operation between the O.C. Field Company and the brigadier—which is essential if the work of the R.E. is to be in any way successful—was impossible when the companies were split up between the brigades.

Much time was wasted on the road moving from one part of the division to another, and, —a smaller matter tho equally important—

great difficulty was experienced in obtaining supplies, as they were invariably sent to the brigade we had just left.

On the introduction of this 3d company, the work went most smoothly. Each company was attached to one brigade, but under the orders of the C.R.E. Division and divisional commanders. This is a most important point, for it is essential that the R.E. should be available for work only where they are needed most, and, therefore, the control being with the divisional commander, if necessary all the companies can be concentrated with one brigade, or on one piece of work.

Now the 3d company simplifies to a great extent the difficulty of co-operation between the O.C. Field Company and the brigadier. Under ordinary circumstances the field company should work, as far as possible, with one brigade, and by so doing officers and men get to know each other's ideas. Nothing makes R.E. work more difficult than when lack of co-operation exists, and where orders are drawn up and then submitted to the R.E. for advice in place of the R.E. advice being obtained before orders are written. As the R.E. work now is the foundation on which all schemes are built, it is disaster to try and carry out co-operation without having first consulted and examined the R.E. conditions.

In the same way, co-operation is essential between the divisional staff and the C.R.E., for in the type of warfare we are now waging, success or failure of any operation depends, to a great extent, on the care with which the engineer details have been worked out.

Now, I propose to come to the time when trench warfare was commencing, and to consider the position of those R.E. units which took part in it, and to show what they were asked to do, how much they were actually able to do, and how they overcame the immense amount of work with which they were asked to deal.

It would be as well just to remind you of the composition and strength of a field company, as from the demands made on us in the earlier stages of trench warfare, one would imagine we had an unlimited supply of men who never needed rest, of tools which never needed repairs or sharpening, and of material which never needed collecting.

A field company, from a working party point of view, consists of 4 sections each under a subaltern; each section being able, at full strength, to supply a working party of 30 men, but which under average conditions rarely exceeded 20.

Thus, supposing the company was attached to work with a brigade, each battalion of that brigade if in need of R.E. assistance would be able to have one subaltern and about 20 men.

I will briefly mention the different calls which may be made on the R.E. during trench warfare.

Site and mark out fire trench.

**ENGINEERS—Continued**

Distribute tools, and place the men at the tasks.

Supervise construction.

Make traverses.

Lay out wire along front of trench say 300 yards.

Dig communication trenches back.

Make machine-gun emplacements in front trenches.

Construct dug-outs for officers and men.

Revet trenches.

Make loopholes.

Arrange drainage.

Repair all damage, and daily wear and tear.

Collect material for all the above.

We got the same calls for the support line, and also for the reserve line.

The brigade had at the same time the following calls on the Field Company, consisting of the 4 sections working as above:

Make strong points near reserve line.

The division also had calls on its 3 companies to

Construct the second line the same as for first line.

The Corps had its calls on the divisional R.E. to

Put points d'appui behind second line into a state of defense.

Third and fourth lines.

Besides all this there were the following by no means simple undertakings:

(1) Cut, collect, and cart all our material for trench work.

(2) Manufacture our hand grenades from stores available, and train the infantry in their use.

(3) Construction of the huts behind the lines for the rest camps.

Later, when the two lines were drawing together, the following additional calls were made on the section:

(1) Run out as many saps as possible towards the enemy.

(2) Commence mining operations against the enemy.

Of course, under the conditions that existed at that time, the work could never have been done in some years. The only troops to assist the field companies at times were 1 fortress company to each corps. Well, let us follow thru the different steps taken to overcome the difficulties.

The first and obvious method was to teach the infantry to do all the simple work on the spot, and to continue training them until they could do all ordinary field engineers work, thus releasing the R.E. for the more difficult.

The following items illustrate some of the work which can be, and is now, undertaken by the infantry, under R.E. supervision—after a thoro course of instruction by the R.E., which before the war was left by them entirely to the sappers:

1. Erecting wire entanglements.

2. Complete digging, revetting, loopholing,

traversing and flooring of the front, support, reserve and communication trenches of the first and second lines.

3. Repair of above-mentioned necessitated by daily wear and tear.

4. Making any necessary saps.

All the above needs no technical ability when the men have been once shown, and with a few weeks of supervision the infantry can carry them out with perfect success.

This leaves the R.E. free to train the infantry in the simpler branches of engineering work and reserve for themselves the more technical duties, such as:

In the front line:

1. Bombproof machine gun emplacements, which consists of concrete and R. S. J.

2. Where the ground admits construct deep shellproof dugouts.

In the first line:

*Strong points.*—These small works require very careful siting and concealing, and it is on them that, in the event of a portion of the front lines falling, time is gained for the counter-attacks. These strong points should be weatherproof and as comfortable as possible.

The same duties apply equally for the second line.

The construction of points d'appui, or strong areas, in the rear. Here much technical work can be done with concrete and steel joists for machine gun emplacements. Infantry parties are essential to assist with digging, carrying and filling sand-bags, etc.

The work still remaining for the R.E.—which the R.E. field companies were originally expected to do is:

1. Bomb manufacture.

2. Drainage.

3. Collection of material.

4. Mining.

When the call was made to the field companies to undertake mining operations, it was seen that this work could only be undertaken by them at the expense of the work on the trenches, so special *mining companies* were formed at home and sent out at once.

The mining companies are allotted to different parts of the front as required.

The mining schemes are drawn out by the army, who inform the corps concerned, and are carried out by the companies.

When mining operations have once started, work has to be kept up at as fast a rate as possible, and to insure success, reports of rate progress, etc., have to be sent in regularly and as soon as possible.

In the case of a mine being fired, reports are wired to the controller, giving all details, and these reports are passed on by him to general headquarters.

Co-operation again plays a very important part in the success of mining operations.

Tho in no way part of his command, the brigadier in command of an infantry brigade holding a length of trench is naturally very interested in the mining operations going on in his front, and the mining companies work in close conjunction with him, obtaining the

necessary working parties to deal with sand-bags, etc., and keeping him informed of progress of work, etc.

The usual gallery now used is about 4' high, 2' 6" wide at the top and 3' at the bottom, measured inside the timbering, and this means a section of some 12 square feet.

Galleries have been run out some 400 feet, which gives us about 5000 cubic feet of earth to dispose of, which will mean some 4000 sand-bags from each gallery.

The great secret of successful mining is "silence," and it has been found that the most satisfactory method of disposing of this earth is to put it in sand-bags and drag it to the head of the shaft by hand or by a winch. Here the infantry should take the bags over for use in their fire trenches. In the event of their having a surplus, an excellent plan is to build a dummy parapet on any available ground high enough to cast a good shadow for aeroplane observation purposes. The Germans have been known to spend the best part of the day shelling such a dummy trench, which can only be distinguished with difficulty from a real one.

Work on the face of a gallery is carried out by three men—one working, one filling bags, and one resting, the number of the remainder depending on the length of the gallery.

The average rate of progress is about 12 feet a day, but galleries in favorable soil have been run at the rate of 32 feet in 24 hours.

The depth of the galleries varies according to the tactical requirements, and may vary from 12 to 120 feet.

With regard to the charges used, there are two distinct types:

a. A common mine, used with the idea of making a crater on the surface and destroying the enemy's work.

b. Or camouflet, used to destroy the enemy's mining works underground, and so charged as to leave the surface undisturbed.

Mines to produce craters have been charged up to 13,000 lbs., producing crater 60 yards long by 40 yards across.

The charges of camouflets varies with the depth of the charge and the soil, and in some cases charges of 2 or 3 tons have been fired without disturbing the surface. The explosives used are those obtainable at the time. Ammonal has been used in large quantities with great success.

Drainage and ventilation are carried out by pumps, and continuous experiments have to be carried out to find the most silent, and, at the same time, effective types. Lighting the galleries is carried out usually by candles, but electric torches have to be used when the mines are being cleared.

**Collecting Material.**—This is perhaps the most important, and, at the same time, most tedious of all R.E. work. Originally the companies cut what timber they could, and collected from houses and villages all suitable material; but the local supply soon became exhausted, and the matter had to be taken up on a large scale.

But there is one point which I am sure

many officers—even R.E. officers—are ignorant of, and that is the quantity of material necessary for putting the trenches in a fit state for occupation in winter. One sees type drawings of various trenches and shelters which are put forward as models to be copied, but when one comes to work out the material necessary one finds that it cannot be obtained. There is never enough, and the supply, cost what it may, must be increased.

The following is a detailed estimate made out for one mile of front, including first and second lines, and all communications. It was made where breastworks are essential, owing to the low ground being waterlogged. It gives you some idea of the material required.

#### *Wire Entanglement.*

1,800,000 yards of wire, or 900 miles. Weight = 110 tons.

#### *Standards.*

6-ft. 12,000.

#### *Small Pickets.*

12,000.

#### *Trench construction.*

Sand-bags =  $6\frac{1}{4}$  millions. Weight = 1000 tons.

#### *Corrugated iron.*

Some 36,000 feet run.

Timber, average dimensions 3" X 3" = 1,125,000 feet run.

Besides the above, large quantities of revetting material are required, including timber, planks, wire netting, and expanded metal.

Now as to the time taken to complete the construction of one mile of such trenches to make them fit for winter occupation. An average man will fill and place in position on the parapet, parados, or dugout, at the most 25 sand-bags in one night. So to fill and place the 6,000,000 odd bags will take a working party of a battalion about 240 nights' work, or some 8 months.

But, and this is the point I wish to emphasize, if the sappers are to complete the job without assistance from the infantry, it will take a field company, with its usual working party of 80 men, some six years to finish.

This brings out the most important ideas:

1. It is essential for the infantry to assist the sappers with every man they can spare.
2. Do not put off the preparation of the trenches for the winter campaign until too late.

With every man working, it cannot be done under 2 or 3 months, and the time to start is, at the latest, the end of July.

Of course, the times I mentioned just now—the 240 days and the six years—are only based upon dealing with the material required in the perfect trench. In actual practice these amounts of material never reach the trenches. But it is not until everyone grasps the enormous quantities needed that the supply will be increased.

With regard to the state of training already reached by the infantry in field works, I should like to give the following example:

In one division the divisional cyclists were handed over to the C. R. E. as a permanent working party to assist the R.E. They were

**ENGINEERS—Continued**

allotted to a field company to be trained as a party for the construction of wire entanglements. This party, after a few weeks' training, assisted by sappers, total strength being 120 men, in 2½ hours ran an entanglement 1200 yards long and 20 yards wide in front of a newly captured position. They used 117 miles of wire, 1600 six-foot iron standards and 1600 pickets. Five days were occupied, before the attack, in carrying up the stores for the work and placing them in a handy position to commence work at the required moment.

Now, I have only been able to give you a very small idea of the work performed by the R.E. I have tried to show how, with the small establishment of engineers and the immense amount of work which the new type of warfare has necessitated, most of the old ideas on the legitimate duties of the R.E. have changed.

The respective spheres of action of the R.E. and infantry are now separated by a stream, the size of which is a measure of the difference in technical knowledge.

The continual personal instruction of the infantry in all matters, formerly supposed to be the exclusive province of the R.E., is gradually draining the stream and bringing nearer the time when the infantry will all be as skilled in pioneer work as the regularly constituted pioneer battalions, while only the most advanced technical matters remain within the completely separated area of R.E. activities.

See also

BRIDGES, MILITARY

DEMOLITIONS

ENTRENCHMENTS

RAILROADS—CONSTRUCTION AND REPAIR IN WAR

**—Instruction and Training**

[Second Regiment of Sappers and Miners. By Antonio de la Roche. *Mem. de Ingenieros*, Apr, '16. 3800 words. Sketches and photographs.]

(Description of different types of field works used by the Allies, Germans, and Spanish. These were constructed by the 2d Regiment of Engineers in Spain for practice. Also description of a wireless instrument to fire mines. It prevents interference from other stations.)

See also

EDUCATION, MILITARY—IN SCHOOLS AND COLLEGES

(Article: "Technical Students Should Receive Military Instruction.")

**—Officers for**

[Complementary Officers, for Technical Engineer Service. By Capt. O. Natalini, Italian Engineers. *Rivista Militare Italiana*, Jan, '16. 3000 words.]

The present war has taken on an intensely technical character, and so requires a large number of officers of some technical qualifications. Such a corps obviously cannot be improvised, but it is nevertheless true that many civilian engineers have had experience that

could be turned to account during hostilities, without special training. The effort has been made in Italy, but the results are unsatisfactory, because there complementary officers have been assigned to duty, sometimes without regard to their qualifications, at other times without taking into account the injustice involved in placing them below their inferiors. Hence, some classification should be attempted, and indeed the War Ministry has shown a desire to make it. But exact rules should be laid down. It is accordingly proposed that three courses of instruction of at least one month each should be opened to complementary officers, lower, middle, higher, and that all recent appointees, candidates for the grade of 2d lieutenant, 1st lieutenant and captain, should take the lower course. The second should be taken by the graduates of the first who had shown promise, the higher by all candidates qualified by serious studies, and considerable experience in engineering work of importance. The failures of the first course should take service as privates in the engineer regiments; those of the second, after a special course at Modena, should pass into the infantry; those of the third should be appointed 2d lieutenant of engineers, and employed in the duties for which fitted.

**—Organization**

[Reserve Army Engineers. *Army & Navy Register*, Aug 12, '16. 800 words.]

The Chief of Engineers, U. S. Army, has sent out a letter to all district engineers setting forth information relative to the reserve authorized by the National Defense Act. The district engineers are enjoined to use every effort to assist in the formation of a reserve of engineer officers. Details of the formation of boards for examination are given.

After a sufficient number of officers and non-commissioned officers have been appointed, companies and battalions will be formed. Manner of recruitment of enlisted personnel will be the subject of later instructions.

**United States**

See also

UNITED STATES—ARMY—RESERVE—ENGINEERS

**ENGLAND****—History**

See also

FRANCE—HISTORY—RELATIONS WITH ENGLAND

**ENTRENCHMENTS**

[Field Trenches Constructed by the First Brigade, First Division, at Plattsburg, N. Y., Sept, '15. By Capt. J. J. Kingman, C. E. *Professional Memoirs*, Jan-Feb, '16. 500 words. 1 plate.]

These trenches, designed to represent a section (150 yds. long) of a continuous entrenched line, were patterned after types now in use in Europe, and comprised a first line, a second line, and a supporting point. The complete trace was taped out by the engineers, and the digging accomplished very rapidly by three regiments of infantry and cavalry. The

soft, sandy soil necessitated revetting the trenches throughout; and 30,000 board feet of lumber was employed, besides barbed and smooth wire, nails, etc. No head or overhead cover was used in the fire trenches, which were so well concealed as to be practically invisible at 100 feet.

The engineer learned the advisability of bringing to future similar encampments the proper quota of engineer train entrenching tools. The entrenching operations proved one of the most interesting and instructive features of the camp.

(The plan and profiles of the trenches are shown in detail in the excellent plate, a copy of which was furnished to each officer of the brigade.)

[War Game—X. The Trenches. Use of Pick and Spade in Modern Warfare. By Lieut. Guido von Horvath. *Scientific American*, May 20, '16. Illustrated. Map.]

(Trench warfare results from a tactical deadlock. The defensive will intrench, and the attacking troops, if unsuccessful, will intrench at the limit of their advance. The trenches described in this article are the standard text-book types. A method of intrenching under fire is described. Wire entanglements are most important elements of the defensive line. Entanglements should be concealed, and entanglements that can be pulled up into position are mentioned as of great value.

A trench deadlock having resulted, three general classes of enterprise will be carried out—(1) the small surprise attack; (2) the larger prepared attack; and (3) the mine attack. Night attacks will be frequent.)

[The Battlefield of the Somme. By a British Officer. *N. Y. Times*, Sept 10, '16. 1500 words. Illustrations.]

(We quote here the more technical part of this article.)

"What are really remarkable, for their military value, are some of the communication trenches and the dugouts. One, at least, of the surviving communication trenches is a tunnel more than a hundred yards long, completely lined with timber, and carried so deep underground as to be secure against everything except mining.

"The larger dugouts are entered thru a steel door; from it you descend a thirty-foot staircase, in which the face and tread of each step are well made of wood. At the foot of the stairs you find spacious rooms in which floors, walls, and roofs are closely boarded. The connecting passages are equally finished, and a second thirty-foot staircase leads down to a second group of rooms treated in the same way. In one dugout, where an extension was being made when the line was captured, there is to be seen an ingenious mechanism for sending up the excavated earth, ready packed in sand-bags, for use in the trench above. Another is arranged as a hospital, with two tiers of bunks, as in an English hospital ship, to hold some thirty patients. Each of these larger dugouts would easily house a whole

platoon and give it complete security under severe artillery fire unless a high-explosive shell or mortar should find its way in at the door.

"Of course, we must not suppose all the German dugouts to be of this excellence. No doubt, only the best have escaped destruction. But the military usefulness of every such dugout is great. It keeps down casualties under bombardment; it can shelter a reserve of machine guns until the moment of our advance; when our troops reach the German trenches it is difficult to clear, perhaps even to find; and, if it is left uncleared in the rear of our advancing men, its occupants may emerge and harass them from the rear with rifle and machine-gun fire.

"Another formidable detail of the German defenses is the trouble taken to provide effective posts for snipers. A typical post, near Fricourt, is the mouth of a small, deep manhole, such as is used in London streets to give access to sewers. It reaches the surface near the highest point of a piece of high ground; the opening is screened by the casual-looking debris of a broken cart, and, at the bottom of the manhole, a tunnel connects it with the German trenches. Each manhole of this kind is well squared, full-timbered, and fitted with convenient iron rungs. Like the dugouts, it suggests that the German troops in the trenches have done an amount of manual labor which, to anyone who has had to organize trench fatigue-work, must seem remarkable."

See also

ATTACK—ON ENTRENCHMENTS  
FORTIFICATIONS—FIELD  
"TRENCH-FOOT"

—Field—Experience with in European War

[Attack of Hostile Works. By Capt. O. Natalini Engineers. *Rivista Militare Italiana*, Jan, '16. 700 words.]

(Impressed by the duration of the present war, and the inability of heavy guns to reduce enemy works on the Italian front, the author recommends underground warfare, as in the long run the surest and best way of overcoming the enemy. His opinion is addressed to his countrymen.)

—Permanent

[Fortifications of the Future. *Scientific American*, May 6, '16. 800 words.]

The comparative ease with which the German big guns have battered down fortifications in this war will undoubtedly modify the whole scheme of defensive works.

According to Lieut.-Col. Boissouet of the French army, the organization of fortified places will be very expensive because of the great extent of territory covered. Each intrenchment will have a town or a city in its interior. It is not to protect such towns (with the exception of Paris) that these fortifications will be constructed; it is because the reasons that conduce to such fortification of any position—such as its being an important junction of roads, a convenient crossing point of a river, etc.—are the reasons which have naturally led previously to the foundation and growth of a city thereat.

**ENTRENCHMENTS—Continued**

The main features are systems of connecting trenches, batteries and magazines completely buried and masked, and protective networks of wire.

One reason for the great expense is the indispensably large number of magazines, shelters, and communicating passages required. They will be subterranean, connected, and so constructed as not to reveal their emplacements on the surface.

There will be a large number of guns, but they need not be of large caliber, since they will not be directed against heavy masonry and concrete.

Since such places will require heavy garrisons, there will be as few of them as possible.

See also

FIELD ARTILLERY—USE OF IN FORTRESS WARFARE

**—Tactics**

[Trench Warfare. Notes from a series of articles by Colonel "Z." in *La France Militaire*. *Revista de Caballeria* (Madrid), Apr., '16. 2400 words.]

**Attack of Entrenchments—Infantry**

Local offensives should never be undertaken unless the situation justifies them beyond doubt. Even when justified by the situation, ample time for preparation should be allowed. Preparation is for the purpose of reducing losses to a minimum.

No infantry that is not morally and materially prepared for victory should be used to attack trenches. The first consideration for success is that the infantry believe success to be possible. It is a mistake to renew an attack on the same point with infantry that once has failed there; especially so when the losses have been heavy. Such infantry would have no moral aptitude for the task.

It is inadvisable, as a rule, to designate for an attack infantry that has long occupied trenches opposite the point to be attacked. It will have noted the difficulties, and have exaggerated them; on the other hand, it is an insensate proceeding to move units into a strange sector at night and require them to attack on the following morning. This would be launching them blindly to their destruction. Time for studying the problem should be allowed. The best method is to select the troops for the attack, conduct them to the trenches from which it is to be delivered, and when their commander notifies that he is ready, launch the attack.

On certain occasions in Belgium, the Germans, wishing to utilize to the fullest extent the enthusiasm of new units, transported them to the front by night and marched them to the attack at daybreak. They advanced into the French fire singing. The dense formations, used to remedy the lack of training, made hecatombs of the assaults.

The offensive spirit is destroyed when the men realize that the attack is useless. In the actual moment of attack, the men know as much about the difficulties to be encountered as do the officers. They do not object to dan-

ger, but they do object to needless losses. All who have fought in battle know these facts and take them into consideration.

With reference to equipment for attacking, it is axiomatic in this war that infantry without matériel is impotent and useless. It cannot attack; it exists only on paper, and is a mere mass of men which cannot function as a constituted unit. By equipment are meant trench cannon, torpedoes, grenades, wire cutters, barbed wire, etc. The commander must see that these articles are provided. Also he must have at least three days' rations and three hundred rounds of ammunition per man and provide for a renewal of these.

It is absolutely necessary that the troops occupy the sector opposing the front to be attacked for a few days before the assault is made. The commander can then instruct subordinates in the plan proposed, assign objectives to units, inform each unit of the support it is to give and receive, and, in short, organize the attack to the finest details. The front must be reconnoitered by patrols up to the very entanglements of the enemy. An able commander will organize his attack without attracting the attention of the enemy.

Methods for artillery support will be discussed in a later article.

[French Military Notes. By J. B. Gautreau (French Correspondent). *Army & Navy Jour.*, June 10, '16. 1000 words.]

Up to the present, Germany has used 5000 guns and a total of over 1,000,000 men against Verdun. Failure to capture it now means a damaging defeat.

Gen. Berthaut, a noted French expert, says: "Every attack by infantry, to succeed, must be prepared by an intense, crushing artillery fire, rendering absolutely untenable the position to be attacked, utterly destroying the defensive organization, trenches, barbed wire fences, filling up dugouts and shelters. Then the attacking infantry can rush forward, but its task is by no means easy. It is met by the 'tirs de barrage,' or curtain fire of the adverse artillery and also by the infantry of the defenders, which quickly leaps back on the positions evacuated and has to be fought in the open in hand-to-hand encounters with bayonets and grenades." Col. Feyler, the Swiss expert, says: "If German infantry had been up to the standard of efficiency of German artillery Verdun would no longer be French."

The Germans have suffered heavy losses, and superiority in numerical and material assets is passing to the Allies. The drive against Verdun is meeting a fate very different from that against the Russian front. The region around Verdun has become a huge labyrinth of trenches.

[Trench Warfare. *Mem. del Ejército* (Chile), Aug., '16. 8000 words.]

A compilation from different sources of the methods adopted in the attack of trenches by the belligerent armies, and as a result of a year and half's experience gained on the battlefield.



## INFANTRY

On every front of the World's War, trenches play a most important rôle. On account of the terrible losses suffered, trench warfare has been named *guerre d'usure*.

A perusal of the official communiqués brings out the fact that the counter-attacks launched invariably by the adversary cause the partial, if not entire, loss of a position which has been gained at a terrible sacrifice of life.

Local attacks should be strongly condemned unless they aim to straighten certain portions of the line in order to reduce the number of men required to occupy the trenches; to build up machine-gun emplacements; to establish listening posts, etc.; also, in order to make preparations for a general offensive.

Every preliminary arrangement, every atom of energy becomes absolutely nil unless the artillery preparation has been a most thorough one.

In no case should the infantry make the final assault without adequate preparation by the artillery. The gravest consequences may result during the progress of an engagement due to a lack of co-ordination between these two branches or on account of a poor system of communication. Unless the artillery is constantly kept informed of the progress of the infantry, this arm might become a target for the artillery.

It is an unpardonable error not to equip the attacking troops with bombs, hand grenades, wire cutters, etc.; or to lead them at night over ground which has not been thoroughly reconnoitered.

Troops that have received a set-back while operating on a certain sector, should not be utilized again over the same ground, as they are demoralized.

When it comes to the employment of infantry and of artillery in the attack of trenches, it may be said that the following principles are some of the results from the teachings of the present war:

Above everything else, and in order to obtain success, it is necessary to employ only infantry which is morally fit and thoroughly trained. The first requirement of success is that infantry may be assured of it whenever practicable. Do not assign for the attack troops that have for a long time occupied the line of trenches, for they have discovered all the difficulties of the operation and they generally exaggerate the hardships.

On the other hand, it is criminal to employ infantry which is ignorant of the difficulties presented by the ground over which the attack is to be made, and for which no preparations have been made.

It is extremely dangerous not to orient and inform the infantry, to the very last man, of the nature of the operation and of the difficulties that may be encountered. Therefore, only troops possessed of the highest morale should be detailed for this kind of work. The influence brought about by the capacity of the officers and noncommissioned officers has a very important bearing on the success

of the operation. Unless the men have absolute confidence in their officers, the attack is lost before it is started.

The only solution is to make the best selection possible of the troops that are to make the attack; to order them beforehand to occupy a designated trench; to give them therein the necessary time for preparation; and not to open the attack until their commander has reported that he is ready to lead his men towards the designated objective.

These two factors, "*fire action and advance*," have been recognized by all belligerents as not having the same meaning as heretofore. Success will not be brought about by these two factors alone, on account of the extensive use of obstacles. In order to win, the infantry attack must be preceded and must be accompanied by powerful means of destruction, such as, fire action in all of its forms, grenades, mines, aerial torpedoes, asphyxiating gases and burning liquids. During the *advance*, the attacking lines are confronted with three kinds of powerful obstacles: barbed wire entanglements, machine guns, and the artillery curtain of fire.

The French tactical unit is the infantry division. Every military movement demands that the division be complete in itself. It should have heavy artillery, field artillery and trench artillery. Under the classification of trench artillery are included cannon of less than 7.5 mm. caliber, or those having a shorter range than the present field pieces.

Trench warfare has established certain relationships between the employment of infantry and artillery. Neglect of these relationships increases the dangers connected with an assault, which are always great. To attack without artillery any system of trenches is entirely out of the question. This requires no proof. When infantry has ventured itself in the attack, without any artillery support, it has always been disastrously beaten. There cannot be too much artillery; at the same time, the number of pieces should be in proportion to the amount of ammunition on hand. Artillery which is short of ammunition is absolutely valueless. In order to save the lives of soldiers unlimited ammunition is necessary. Howitzers, 75's and 58's should go to make up the quota of artillery material. No accurate data exist as to the proper proportion of these different calibers. Some authorities are of the opinion that after the present war the smallest caliber to be used will be 10.5.

The primary rôle of artillery is to assist infantry. Who are the eyes of the artillery? The observers, and they should be in the trenches, breathing the same air as the infantry, learning its wants and its wishes. Of course, the artillerist will place his guns to the best advantage, but, throughout the attack there should be the closest co-operation between the infantry and artillery commanders and the observers.

No one pretends to rob the artillery of its initiative. This initiative will be of the greatest value when its object is to overcome

**ENTRENCHMENTS—Continued**

the enemy's artillery. But this point must be insisted upon: that the best way to bring about a close co-ordination is to carry out the wishes of the infantry.

The artillery preparation is an advantage which the infantry does not want to undervalue. Due to the fact that surprise attacks and even night attacks have prevented the use of an intensive artillery fire just before an engagement, these forms of attack have been practically abandoned. For the same reason, attacks at dawn, which heretofore were very much recommended, are losing their importance.

Two things are needed by the infantry: first, to know where it goes and to see the ground over which it will march; and, second, to take every advantage possible derived from the fire of its artillery.

The best hour to launch an attack is between the hours of eleven and noon. This time also has the advantage of limiting the hours available for a counterattack by the enemy. Of course, this is not an inflexible rule: the Champagne attack was begun at nine o'clock in the morning.

It is true that all these methods of warfare do away with the advantages emanating from a surprise or a night attack. But the present day methods of defense adopted by the enemy are so strong, with their system of wire entanglements, listening posts, war dogs, etc., that a surprise is almost impossible. The real surprise now is the accumulation of a large supply of artillery material and its rapid and effective use. The wishes of the infantry should always be considered in order to determine the most advantageous use of the artillery. Infantry always wishes, just prior to the assault, that the artillery should deliver a very effective fire on the position occupied by the enemy. It even prefers to run the risk of being struck by this fire to launching the attack without any artillery preparation. The necessity of this preparation is felt even during the first stages of the assault. The infantry demands that during its advance the artillery continue to push ahead its protective curtain of fire. Also that the artillery, in order to prevent any flanking fire, cover to the right and to the left.

To carry out the above plan it is necessary, not only that the infantry and the artillery should maintain close tactical connection by means of telephones, flags, orderlies, etc., but, in addition, that the artillery commander and observers *live* during the battle alongside the infantry commander. The dangers connected with the changing of artillery positions while an engagement is in progress are very much exaggerated. Indirect firing facilitates these changes of positions; in addition, the enemy is too busy at this particular time. If precautionary methods are required, move only one battery at a time. It must not be forgotten that very rarely will the infantry be so far away as to preclude any possibility of its being able to render assistance.

No definite rules can be laid down for trench warfare. Every day new lessons are

being taught, and each belligerent is constantly changing his methods of warfare, at least, in the manner of execution. It has been stated before that there is no greater mistake than to undertake attacks, the necessity of which has not been clearly demonstrated.

*Action brings reaction.* The attack on an enemy's trench should never be undertaken except after a careful study of the situation; but, once launched, the objective must be gained, with the minimum amount of losses and with this one idea in mind, of holding the ground captured. The assault must be of short duration. It cannot be so, unless the attack has been well prepared, well arranged, and every detail attended to before hand. Between any advantage that may be gained through surprise, which is not possible in trench warfare, and a careful preparation by the supporting artillery just before the attack, the latter method is preferred by the infantryman. To attack blindly a line of trenches is a thing of the past. To believe that if the difficulties of an attack are known to the infantry, its offensive spirit is reduced, is nothing but a fallacy.

Not all troops are fit to be selected as "attacking troops." This selection should be confined to those troops that are thoroughly trained and disciplined and have absolute confidence in their officers. What is needed to launch an attack? An infantry well armed and prepared to win; an artillery ready at all times to gain and keep a decided fire superiority over the enemy's artillery. In addition, there is needed a commander who is energetic, prudent, patient and who inspires the confidence of his troops.

**MACHINE GUNS**

Those who before the war belittled the value of machine guns, now must see their error. The argument that these weapons consume a great deal of ammunition has no standing whatsoever.

Machine guns are to be used only at certain times, when their moral effect is so great and when the rifle is of so little practical value that the sacrifices demanded to obtain an adequate supply of ammunition are more than compensated. The French have paid dearly to find out that their theory that machine guns were only good for an advance, was a false one. Trench warfare has put the machine gun in the very front rank because it is a weapon which economizes men. The Germans assign machine guns to cover a certain sector of the enemy's defensive line. These machine guns are constantly at work, especially at night, battering down the French trenches in order to make life unbearable in them. On the day set for the attack, these machine guns are not feared very much because generally their emplacements have been located and consequently destroyed by artillery fire. If their machine guns have escaped artillery fire, they can only continue firing in a line perpendicular to the attacking front, and they are no longer an element of surprise. The system of periodic lulls with the machine guns, used by the Germans, is more

or less known to the French. What the infantry fears most are the undiscovered machine guns used once the attack has begun. Troops know that during the attack, they will be subjected to machine gun fire from guns which, up to the very last moment, have been kept absolutely silent. The Germans generally locate their machine guns in the direction of depth in order to increase the resisting power of the first line trenches. These machine guns occupy a flank position so as to bring in at the opportune time a flanking fire on the attacking line, especially on ravines where there is a tendency for troops to bunch. At times machine guns are located in casemates, but then there is danger of the latter being blown up. For this reason, machine guns are buried close to the emplacements, and when the attack has been developed, they are carried to their emplacements, which are hard to locate, through subterranean galleries. The friendly machine guns should always be ready to neutralize the effect of those of the enemy. To accomplish this, they should be located in the flanks of the advancing lines, which they will accompany during the advance, and, in certain cases, precede. The machine gun has awakened such an enthusiasm in Europe that there is some talk of assigning machine guns to the artillery.

#### —Use of in European War

[German Trenches on the Somme. *N. Y. Times Magazine*, Sept 24, '16. Quoted.]

"The advance of the Anglo-French armies under Generals Haig and Foch, in the Somme region, has finally revealed to the Allies the German system of trench architecture, which is undoubtedly the most remarkable and elaborate method of housing troops ever evolved in the long history of warfare. Twenty, thirty, and even forty feet below the surface of the ground the allied soldiers have found these villages, lighted with electricity, with spacious and well-equipped quarters for officers and men. In one underground apartment there was a hospital with thirty-two beds and an operating room; in another there was convincing evidence that its occupant, an officer, had lived there with his wife and child.

"Lieut. Col. F. G. Newcomb of the Royal Engineers recently completed a set of drawings of German trench life, and these sketches, given to *The New York Times* by an official of the British Government, are reproduced here. The explanatory article is also the work of an engineer officer of the British forces in France. He writes as follows:

"Along many miles of the western front, as it was till the end of June, you can now do what seems to trench dwellers almost the utmost reach of impossibility. You can stand at your ease in the middle of No Man's Land and look at a German front trench on your right and a French or British front trench on your left. As soon as you do so you feel that the outward face of each wears a quite different expression.

"It is not merely an accident that the Allies' wire is only cut across by neat lanes or gangways at convenient intervals, while the Ger-

man wire lies in a trampled mess on the ground. The difference goes much further. For one thing, with Allies support their barbed wire mainly with wooden stakes; the Germans do it with iron. For another, the Allies' parapet owes much more of its strength to visible sandbags. The Germans build with sandbags, too, but not so much nor so openly. Their parapet makes more show of rough clay or chalk, even where a light layer of this covers two or more feet of reinforced concrete placed like a shrapnel helmet on the head of a dugout or a gun emplacement.

"If you now leave your first standpoint and explore the two trenches in turn, and also the support and communication trenches behind each of them, you find that the difference goes, in more than one sense, deeper still. The allied trench looks in every way like the work of men who hoped and meant to move on before long; the German trench looks like the work of men who hoped, or feared, that they would be in it for years. Our trench housing has been much more of a makeshift, a sort of camping out, with some ingenious provisions for shelter and comfort, but not more than the least that would serve. Most of our dugouts are just roughly dived holes in the earth, with only enough props and rafters to hold the roofs up; their floors are bare ground, with a little straw on it; their doors, if they have any, are a few odd pieces of plank with a couple of other pieces nailed across; often the floor is on the trench level, to save burrowing. Lighting is done with candles, mostly bought at the canteen, and if any one owns an armchair or a two-foot-high mirror it is the jest of the platoon.

"The whole German idea of trench life is different. The German front in the west is like one huge straggling village, built of wood, and strung out along a road 300 miles long. Of course, the houses are all underground. Still, they are houses, of one or two floors, built to certain official designs, drawn out in section and plan. The main entrance from the trench level is, sometimes at any rate, through a steel door of a pattern apparently standardized, so that hundreds may come from the factory on one order and missing parts be easily replaced. The profusely timbered doorway is made to their measure. Outside this front door you may find a perforated sheet of metal, to serve as a doormat or scraper.

"Inside, a flight of from twelve to thirty-six stairs leads down at an easy angle. The treads of the stairs and the descending roof of the staircase are formed of mining frames of stout timber, with double top sills; the walls are of thick planks notched at the top and bottom to fit the frames, and strengthened with iron tie-rods running from top to bottom of the stairs and with thick wooden struts at right angles to these. At the foot of the stairs a tunneled corridor runs straight forward, perhaps up to fifty yards, and out of this open rooms and minor passages on each side. In many dugouts a second staircase or two staircases lead to a lower floor, which may

**ENTRENCHMENTS—Continued**

be thirty or forty feet below the trench level.

"All these staircases, passages, and rooms are, in the best specimens, completely lined with wood and as fully strengthened with it as the entrance staircase already described. In one typical dugout each section of a platoon had its allotted places for messing and sleeping, its own place for parade in a passage, and its own emergency exit to the trench. In another, used as a dressing station, there are beds for thirty-two patients and a fair-sized operating room. A third, near Mametz, was designed to house a whole company of 300 men, with the needful kitchens, provision, and munition store rooms, a well, a forge riveted with sheets of cast iron, an engine room and a motor room.

"Many of the captured dugouts were thus lighted by electricity. In the officers' quarters there have been found full-length mirrors, comfortable bedsteads, cushioned armchairs, and some pictures. One room is lined with glazed "sanitary" wallpaper, and the present English occupant is convinced by circumstantial evidence that his predecessor lived there with his wife and child. Clearly there was no expectation of an early removal.

"Nobody who reads this should leap to the conclusion that simply because German trench work is more elaborate than ours, it is a better means to its end—the winning of the war. No doubt the size and the overhead strength of German dugouts keep down casualties under bombardment and sometimes enable the Germans to bring up unsuspected forces to harass our troops in the rear with machine gun and rifle fire when a charge has carried our men past an uncleared dugout of the kind. On the other hand, if our advance is made good, every German left in such a dugout will be either a dead man or a prisoner.

"No doubt, again, the German dugouts give more protection from very bad weather than ours. But they also remove men more from the open air, and there is nothing to show that the half-buried German army gains more by relative immunity from rheumatism and bronchitis than it loses in the way of general health and vitality. In England troops have better health in tents than in huts, and better health in huts than in billets. For a man of sound constitution, 'exposure' often means something unpleasant rather than unhealthful, and it would not be surprising if the close, underground villages of the Germans yielded higher figures of general sickness than our own simpler, shallower, and more airy trench shelters."

**ESPIONAGE**

—Ethics of

See also

ANDRE, MAJOR

—In European War

[Taking no chances. *Independent*, Dec 6, '15. 100 words. Illustrated.]

The French Minister of War has ordered posted in all railway carriages, trains, and

omnibuses a warning—"Do not talk. Be careful. Enemy ears are listening." It is a precaution against the hostile espionage system.

[Leakage. *Army and Navy Gazette*, July 29, '16. 600 words.]

It has been necessary for the British Army Council, after two years of war, in which there has been ample evidence of enemy activity in obtaining military information, to issue an order against making public anything of possible assistance to the enemy. It appears that those in the military service have by letter, telegram and personal interview, communicated military information to those at home, and have even elaborated codes for that purpose. These items may become known to the enemy, and "severe measures" are promised against offenders. The free use of the mails hitherto accorded the public has thus been abused and may have to be curtailed.

**—Precautions Against**

[Restrictions on Aliens. Editorial. *Army and Navy Gazette*, Feb 12, '16. 500 words.]

There is need of caution in conversation in public places, and in the selection of hotels and boarding houses. Young officers are more careful in conversation, but hotels and boarding houses kept by aliens or in which aliens are employed constitute a source of danger. They possibly afford an opportunity for examining the mail of guests, and while no important piece of information might thus be revealed, small items of information are often valuable as confirmatory evidence. No one should reside in a place where aliens have access to their correspondence.

**EQUIPAGE**

See also

FIELD GLASSES

INFANTRY—ARMS

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**EQUIPMENT, Military**

See also

CAVALRY—ARMS

CAVALRY—EQUIPMENT

**EQUITATION**

[Reflections on Our Military Equitation. By 1st Lt. R. Gerbex, Adj. 1st Dragoons. *Rev. Mil. Suisse*, Mar, '16. 2700 words.]

In our service there are very marked differences of opinion on equitation. There are very few real masters capable of imposing their ideas and of realizing a uniform method of instruction throughout the army. It would seem that there are as many methods as there are instructors. An example: the seat prescribed in the regulations is supple and easy with the flat of the thigh against the quarters of the saddle. Quite a number of instructors force their people to ride with the thighs almost vertical. Quite a number of instructors require the elbows to be carried close to the body, which effort makes the trooper stiff and takes away the freedom of his hands.

These are merely two examples to show the lack of uniformity. What are the reasons? 1°. We have no school, therefore no

unity in our teaching of equitation; 2°. Our instructors go, or used to go, to serve a few months in Germany, Austria or elsewhere. Each would return with a different conception of the practice of the noble art of riding a horse. Their few months' glimpse of a two or three years' course did not give them a very deep insight into it. So that they brought back to us impressions rather than a conception of the system. Hence, there are striking differences of opinion.

\* \* \* \* \*

Candidates for commissions in the infantry take about 30 lessons in riding. On account of the short duration of the course, it has been a great deal neglected, with the result that for most of those who have had it, the horse remains an unsolved problem. A good instructor can, however, accomplish a great deal even in a short period. It is possible to give the pupil a good seat, supple and firm at the same time; and on that physical training depend the confidence and assurance that enable the trooper to use his aids correctly. If the student got this much out of his course he would less often await the perspective of the third stripe before showing an interest.

In the artillery the instructor has two distinct missions: he should direct the technical instruction of the arm and, on the other hand, should know everything concerning equitation and harnessing. As far as may be judged the situation in the artillery is more difficult than in the cavalry. We find the same errors in mounted instruction but more accentuated; then the officer does not have the advantage that we do of buying a service horse at half price.

To sum up: 1°. Even the best regulations are insufficient to make one understand a method of equitation; 2°. In the absence of a theory based on simple and progressively developed principles, our instruction lacks unity, hence strength.

We need a school for centralizing instruction.

## EROSION

—Of Artillery

See

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## EUROPEAN WAR

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[The Great European War, from 1914-15. *De Militaire Spectator*, No. 9, Sept. '15. 6000 words. 5 drawings.]

This article is a review of the great struggle going on in Europe covering:

- (1) The field operations in Russia.
- (2) The operations in Italy.
- (3) The operations on the Gallipoli Peninsula.

[The Military and Political Monthly Review up to August 29th. By "F." *De Militaire Spectator*, No. 9, Sept. '15. 7500 words.]

(This article contains a digest or review of political and military news from the Netherlands, Belgium, Germany, Austria-Hungary, Italy, France, England, Russia, Denmark, Sweden, Norway, Switzerland, Portugal, Bulgaria, Serbia, Rumania, Albania, Turkey, the United States, Mexico, Japan, and China.)

[The Diplomatic Books. By José Paulo Fernandez, Capt. of Art. *Revista de Artilleria*. Oct. '15. 4400 words.]

(A recapitulation of the Diplomatic Books issued by each of the belligerent governments.)

[War Notes. By Capt. H. M. Johnstone. R.E. (Retired). *United Service Mag.*, Dec. '15. 5500 words.]

The attitude of Greece was favorable to the Allies at the outbreak of the war, but Greek opinion has been affected (1) by a loss of confidence in the military power of the Allies; (2) by a loss of diplomatic confidence due to the fact that the Allies wanted Greece to make territorial concessions to Bulgaria; and (3) by a loss of confidence in her own ability to affect the military situation.

\* \* \*

The ratio of killed and wounded among officers and men remains substantially the same as for the western front in September—killed, one officer to 15 men; wounded, one to 25; and missing, one to 23. The ratio in missing is much higher than in France, 1 to 23 as against 1 to 35 and at an earlier date 1 to 45. The explanation is apparently in the diminishing number of regular officers.

Analysis shows that Great Britain, France, Russia, Italy, Belgium and Serbia cannot afford to lose in this war. It is plain also that Germany cannot afford to lose, though neither Austria nor Turkey have so much at stake, and it may perhaps be said that they can afford to lose. Since neither side can afford to lose, it is a question of which side can win, and the author thus concludes that the Allies will triumph.

\* \* \*

Winter has set in early in Russia, and promises to be severe. The hardships of trench life in winter are much alleviated by the presence of a town or village just out of range in rear of the line, so that the troops will have a warm and comfortable place to spend their time off. Another important thing is the ratio of time off to time on duty, so that conditions are much more severe if the line is inadequately manned. With too few troops, the hardships produce a high sick rate, thus calling for reinforcements. Once the pinch comes on account of lack of troops, it serves to aggravate itself.

\* \* \*

(The remainder of the article is a discussion of the then rapidly changing Serbian situation.)

[Maneuvers and Objectives. By José Paulo Fernandez, Capt. of Art. *Revista de Artilleria*, Nov, '15. 4300 words.]

A résumé of the main objectives of each country engaged in the war, and of their preparatory maneuvers before the war; followed by the actual maneuvers and dispositions after the outbreak of war, with the lessons to be learned therefrom by small countries.

[The Sciences and War. By José Marvá, General de División. *Memorial de Ingenieros*, (Madrid), Nov, '15. 36500 words.]

(The inaugural discourse of the 5th Congress of the Spanish Association for the Progress of the Sciences, in Valladolid, 17-22 Oct, 1915.—Ed.)

The beginning of the 20th century is witnessing the spectacle of a war without precedent in history; not of an army *versus* an army, nor yet of a nation *versus* a nation, but involving the inhabitants of all the continents; not only such a battle as the immortal Don Quixote, in his disordered imagination, thought he saw in the contest between the droves of sheep, but a struggle captained by emperors and kings, princes and grand dukes.

In this terrible fight the very foundations of nationalities are being attacked, monuments, admirable works of the architectural art, museums and libraries are being destroyed; and a campaign of calumny and of books, white, green, red, and of all other colors, is being waged; and each belligerent appears as the custodian of Liberty and Right, with the opponents representing Cruelty and Barbarity.

In short, everything is legitimate in view of the supreme necessity to win. So numerous and grave have been the infractions of the Hague

conventions that peace conferences have availed little for the final triumph of Right. Belligerents have not scrupled to open hostilities without previous notification; to declare extinct, suspended, or inoperative the legal rights of the citizens of an opposing government; to confiscate private property; to violate postal communication of neutrals; to cut submarine cables; to commit acts of hostility against neutral vessels; to place automatic contact mines on an adversary's coast with the sole purpose of intercepting mercantile navigation; to bombard, by every means, undefended cities and towns, without respect for buildings dedicated to art, science, and culture; to destroy historical monuments and hospitals; and to employ projectiles, arms and matériel which cause unnecessary suffering. The lists of contraband of war have been extended to an unwarranted degree; and the interests and complaints of the weak as well as the friendly protests of the powerful have been ignored.

Moved by these violations, and by the sight of such awful consequences, operators have exclaimed: "*War and science* are antithetical terms; war gives the right to the most powerful, and science the right to those who possess science; the one deprives a nation of life and property, the other is the fountain of the Common Law, the guaranty of the home and of country; the first is the past with all its horrors, the second is progress with its benefits; yet, notwithstanding, science is, in the present age, the most powerful auxiliary of war."

If such is the mission of science, those who love it and laud its progress, but who, above all, believe that in right there is reason, and that where force dominates there is neither right nor reason, must protest against the fact that the advances of our century, instead of improving our lives and social condition, contribute to the extermination of the race. Each victim of the war is one intellectual being less and one body more to plead for revenge and to increase hatred. But, on the other hand, it may be asked: "Is science guilty of the destructive use made of it?" In other words, was Berthelot culpable in making thermochemical investigations because anarchists use explosives in bombs?; or was Guttenberg guilty of crime because there are pernicious and immoral books?

Fortunately, science cannot be indicted on these counts; and it is greatly to be hoped that, with further advances, war will be made impossible and that science will become the defense of the weak and cease to be the powerful arm for the strong.

#### I.—Metallurgy

In the application of the sciences and allied arts to the art of war, metallurgy occupies a prominent place. The metals are the basis of construction of all matériel, of whatsoever sort and application.

In the arts of peace, progress tends towards large dimensions and high velocities; and in the art of war this is most evident in the large caliber, long-range guns. To obtain the surprising results that we see in modern artillery.

**EUROPEAN WAR—Continued**

very difficult problems of siderurgy have been solved. The gas pressure in the bore of a large gun sometimes exceeds 3000 atmospheres, and its instantaneousness, calculated in hundredths of a second, causes the explosion to act as a violent shock. These high pressures set up tangential strains unequally distributed through the wall of the gun, and longitudinal strains throughout the tube. The mechanical effects of the gases of explosion, increased by corrosive action, shorten the life of these weapons enormously.

The high temperature of the gases causes decarburization of the metal, and the rapid cooling which follows produces changes due to repeated expansion and contraction, which, according to Rosenhain, set up a certain degree of superficial temper and a network of infinitesimal fissures, in which the powder gases have a further deleterious effect on the interior of the metal. In addition, the current of gases from the muzzle produces, by erosion, grooves in the bore.

To diminish strains and erosive effect, powder of low-burning temperature is used, and guns are built up by a succession of tubes and hoops; but even under these conditions of construction and use, the life of the gun is shortened in proportion to other conditions necessary for increasing initial velocity, and with increased caliber. The last condition requires much heavier tubes, in which the inequality of tension increases alarmingly; and, since the powder charge increases with the cube of the caliber in similar guns, the increase of initial velocity requires increased weight and density of the charge, and definitely results in greater mechanical and physical causes of erosion.

The requirements of military and naval architecture also demand the aid of metallurgy. The hulls of modern vessels must be light and strong, and require strong and ductile material; that is, with a high *coefficient of quality*, capable of sustaining shock without injury. Armor plate must have, in addition to tenacity, a sufficient impenetrability to stop projectiles. The metal must be hard on the surface and tenacious and infrangible in the interior.

All these diverse and at times contradictory qualities have been obtained, thanks to chemical advances and scientific fabrication. In these advances, special mention must be made of microscopic metallography, a new and powerful means of investigation, which permits the inspection of the complicated process of heating, cooling and solidification of alloys, and by means of which the laws of crystallization of a solid mass can be studied and a definite chemical formula of insoluble combinations can be written. It is an efficacious complement to thermal analysis, and aids in the solution of those problems in which chemical analysis has heretofore proved ineffective, assisting greatly towards a more complete knowledge of the characteristics and properties of steel, of the influence of metals and

metalloids in the solubility of carbon in iron, of the qualities of pig iron and of the process of cementation.

Nor must the improved processes of fabrication be neglected in this consideration. Laboratories now have greatly increased facilities for testing the strength of metals. From machines of a capacity of 30 to 50 tons, we have passed to 1600 and 1800 tons. The energy of crushing blows is not now measured in kilogrammeters, but in ton-meters; and enormous furnaces, forges, and other machines keep pace with the necessities of modern manufacture. And to all this may be added the perfect uniformity of functioning, guaranteeing homogeneity of product.

Again it may be asked: "Do these processes have no other object than the fabrication of material of war?" And again it may be answered: "Certainly not; science takes multiple forms; one of the greatest is that of metallurgy; and its favors are awarded impartially to the arts of peace and war.

## II.—*The Radio-telegraph—Application in war—Progress—Application in peace.*

Modern social relations have broadened life so much that men desire better opportunities to travel and live in the uttermost parts of the world; and, as a necessary auxiliary to this new life, better means of communication are essential. Not the least—or perhaps even the greatest—of these is the wireless. The solidarity of the human race would be lost if the social molecules could not be in touch, throughout the world, by a network of intercommunication, and the development of the wireless is due to the demand, not only for constant communication, but for rapidity in the transaction of the world's business.

Granting, then, the value of wireless for social relations, the necessity for its employment in armed conflict becomes the more imperative.

When battles were fought in full view from a neighboring hill, under the eye and personal direction of the commanders, battalions were moved like chess, and everything depended on the "*touch of elbows*." But in war there has operated the same phenomenon of expansion as in the peaceable relations of society. The "*touch of elbows*" has been rejected; distances have greatly increased; and warfare is conducted from concealment. At the same time the means and methods of war have correspondingly augmented. War is no longer a local conflict; it is a conflagration of races; and for such a struggle there are no circumscribed theaters; its stage setting is the globe. There are no spectators, for all humanity takes part in the drama. Napoleons do not exist; the magnitude of the struggle and its complex mechanism escape the control of a single brain.

Having thus extended the operations of war over continents and seas, the control of individuals, battalions, and armies must be coordinated, through great general staffs, by the commanders and government heads; and before the invention of the wireless this was



accompanied by a vast network of wires and cables that might be likened to the nerves of a monster warrior. But, on the application of this new factor in the struggle, this new *arm* more efficacious, more powerful, more important than all other means of communication, a new phase of warfare has appeared.

The control of direction of radio-telegraphy is akin to that of the direction of light by means of reflectors; in other words, the principle is that of the searchlight, except that while the infinitesimal wave length of light permits the use of reflectors of small dimensions, the length of electric waves, measured in hundreds of meters, would require reflectors of many square kilometers of surface. However, the problem has been solved partially by means of antennæ of special forms and dimensions.

The potentiality of transmitting stations has been increased by various means, one of which is the increased volume of the spark and the greater height and varied form and disposition of the antennæ, thereby producing powerful waves of great length which cross the greatest obstacles and reach a vast distance.

Culver and Riner are testing a receiving apparatus in which the antennæ are horizontal, low and relatively close together; and the station can be quickly set up. As the electric waves after proceeding a long distance, frequently lack the energy to affect the coherer, the telephonic is substituted for the telegraphic method and the distances reached by using the tube of filings are about three times as great as with the telegraph.

The Branly detector system, which gave life to radio-telegraphy, was supplanted by the electrolytic, which, in turn, has given way to crystal detectors—containing carborundum and silicon—by means of which there are received delicate waves impossible to the electrolytic detector. Transmission by sonorous sparks, with quick extinction and variable sound, has been invented. In the telephone receiver, under this system, there is no longer heard the harsh sound produced by the spark, but the receiver is tuned to receive the seven notes of the musical scale, by means of an apparatus multiplying the number of sparks per second, and, as a consequence, the "trains" or successions of sparks. By this method, and with an equal consumption of energy, the distance is increased, due to the greater sensibility of the hearing to sharp notes.

Although the telephone receiver has added greatly to the radius of wireless, it has the inconvenience of requiring personal attention—that is, the application of the ear to the apparatus at all times—and has no aid from written, or automatic signals. An effort is now being made to devise an automatic receiver suitable for telephone service, so that messages may thus be made of record, and the rapidity also be increased. Two methods have been devised to date: one uses a galvanometer and photographic register, and in the other the diaphragm of the receiver is sensi-

tized by a flow of gas, the record being made by a stylus on a strip of paper.

The waves propagated by a transmitter affect all receivers within its radius; and while this is advantageous under some circumstances, it is undesirable when secrecy is required. Hence the problem of synchronization to which so much attention has been paid in order to afford communication without interruption. "Trains," or successions of waves, maintaining a uniform amplitude and length after propagation, but variable at will, best serve the purpose. Sonorous sparks, giving the desired musical note, have facilitated synchronization, by transmitting 20,000 to 40,000 waves per second. The last innovation is transmission, not by means of a spark, but by alternating current dynamos sending the current direct to the antennæ, from which the waves are projected into space. These waves are uniformly powerful and of great amplitude, are propagated with perfect regularity, consume the same energy as with the spark, are not greatly influenced by the varied conditions of different hours of the day, and permit excellent synchronization at the receiving station.

From these inventions the next logical step is the wireless telephone. Duddell, with his sonorous arc, and Paulsen, who has increased the frequency of vibration to 500,000 times a second, have laid the foundation for the telephone, which will provide direct communication without the employment of special personnel to operate the stations.

Radio communication is now being used with numerous appliances for safety at sea, notable among which are compasses and coast signal stations. These stations send waves of distinct characteristics, and may be operated from a distance. Compasses synchronized to such signals will show by the movement of the needle the direction of the station by which they are being actuated. Railroad block signals may be operated in a similar way to show the direction of movement and the proximity of trains.

From these achievements it is not too great a stretch of the imagination to picture for the future the wireless transmission of sight. Results that have been accomplished with wires can be produced without wires, with no limit to possibilities.

### III.—Railroads.

The enormous number of men and quantities of material that have been transported by rail in the present war make of the railway an arm of the service as important as the rifle and the cannon. The thousands of trains employed in mobilization and concentration prove the truth of this assertion. Hundreds of trains transport army corps daily, with their impedimenta, from one field of operations to another, and supply them with rations and munitions. The organization of railway service, and the strategic location of lines are capital factors for initiating war, conducting it, and bring it to a triumphant conclusion. This powerful aid is due to the rapid im-

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provement of this means of communication in the last twenty years.

The locomotive has been the object of continuous improvement in safety, reliability, economy of operation, speed, and power during this period. To accomplish these improvements, with a minimum of fuel consumption per horsepower developed, the steaming capacity of the boiler has been increased by increasing its dimensions and that of the fire box, and by diminishing in the latter the loss of calories from imperfect combustion, thus obtaining the maximum production of steam by a better proportion between the direct and indirect heating surfaces and a favorable disposition of the water tubes, the fire box and the smokestack. The reserve water is heated by the escaping steam and by the gases of combustion; the steam is superheated, thus increasing the pressure to 14-16 atmospheres; and it is utilized by improved high and low pressure cylinders. Siderurgical progress now permits four revolutions of the drive-wheels and five meters of travel of the pistons per second.

Locomotives of 100 to 170 tons weight and tractor force of 20,000 to 30,000 kg. are numerous. The shops of the A. T. & S. F. Ry. of the United States have produced the colossal Mallet compound articulated locomotive of 227 tons, with a tender of 113 tons carrying 15,000 litres of fuel oil and 45,000 litres of water; the boiler is capable of resisting more than 16 atmospheres and has 785 square meters of heating surface; cylinders, for high and low pressure, of 711 and 965 mm. are installed; the length of travel of the piston is 833 mm. per stroke; and the tractor force of the engine is 50,000 kg.

(See article for detailed discussion of the latest improvements in steam locomotives, for description of electric locomotives, and for operation of block-systems, etc.)

**IV.—The Automobile.**

Mechanical traction has become a paramount factor in war; and there can be no doubt regarding the locomotive,—just referred to—and the automobile. Both are of supreme importance. As the railroad has served, and is now serving, for transportation of men and supplies where available, so the automobile serves for rapid and effective transportation where railroads have not been built, or in addition to rail transportation.

The best autotruck has a capacity of 3 to 5 tons and an average speed of 12 to 16 km. per hour for 12 to 15 hours a day, thus giving ton-kilometer results twenty times as great as horse-drawn vehicles.

General Gallieni moved 70,000 men in 4000 taxis from Paris to Meaux (65 km.) in six hours to attack the flank of von Kluck's army before the battle of the Marne.

The progress of improvement in the automobile has been constant and rapid. The motor has been the special object of study. The sporting character of automobilism, which at first took the public fancy, has given

way to industrial development. Motors of six and even eight cylinders are in common use; and in order to reduce the length of the frame the driver's seat is, in autotrucks, generally placed partially over the motor, although this interferes in a measure with easy inspection of the machine. Iron tires are better than hard rubber; and standardized interchangeable parts facilitate quick repairs.

The proportion of useful load to dead weight has reached 50%; the mean speed of autotrucks is 15 km. per hour with a maximum of 25 km., and the hill climbing ability is from 4 to 6 km. per hour on a grade of 12%.

The improvements have reached such a point that the most necessary thing to-day is the bettering of highways to fit them for this new kind of mechanical locomotion. Agriculture is already utilizing motor traction, either with the motor independent or as an integral part of the agricultural implement.

The automobile is no longer the rival of the locomotive, but its natural auxiliary, and all forms of industrial and military transport will eventually be mechanical.

**V.—Aerial Navigation.**

Aerial navigation is known to-day more as an agent of destruction than otherwise. Towns and cities that believed themselves secured by lines of fortification or natural defenses now see themselves menaced by the terrible meteors thrown from the upper air by human hands. For the air vessel there are no hidden folds of the earth, no invisible columns, reserves, parks, nor convoys; nor even may submarines hide themselves beneath the water.

Now that the airship seeks its dynamic or static support in the air; and since the air, whether in repose or in movement, disturbs stability, recourse must be had to aerodynamic or mechanical methods to obtain the greatest sustaining force, the most complete stabilization, the least resistance to movement, and the lightest propelling machine having a maximum efficiency per unit of weight.

More than one hundred years elapsed between Montgolfier's successful flight and Renard's proof of the practicability of dirigible navigation with the balloon *France*; and the attempts of man to imitate bird flight also commenced at a very early date. The advances since the Wright brothers recently showed the practical way have been enormous, and the results are generally well known.

The problems are: the form of the wings and the manipulation of the tips; the best angle of incidence, total or differential, to obtain the minimum displacement of the center of pressure; the preservation of longitudinal and transverse equilibrium; and the motor.

Since it is evident that the ease of equilibrium which birds find in their flight is impossible of accomplishment by human agencies, recourse is had to automatic stabilizers to relieve the constant attention necessary from the pilot. These neutralize the irregular ac-

tion of air currents by varying the centers of pressure and of gravity,—utilizing for this purpose the metacentric and the gyroscopic principles.

The motor is the principal factor in successful flight. It has grown in power and perfection and its weight has been reduced, so that the Argus, Gnome, Mercédès, and Rohne motors, of more than 100 horsepower, and the Salmson, of 200, giving a speed of as much as 120 km. per hour for 18-hour non-stop flights, are the types of the best machines. The best propeller now has variable speed and power due to a possible change, at the will of the pilot, in the length of the blades.

The Sikorsky aeroplane is now built to carry a dead weight of three tons at 100 km. per hour to an altitude of 2000 meters. This cargo may include passengers, armor, guns, and munitions, in addition to the pilot.

The strength of the frame and shrouds of the aeroplane has been constantly increased by the use of better materials; and by a careful mounting of the motor and other propelling machinery, vibration has been reduced to a minimum.

Safety devices give aviators greater confidence. The parachute is being rapidly perfected, to provide a factor of safety when the machine is disabled; and devices to stop the rapid progress of the machine on landing on rough ground, as well as compasses for orientation of flight, all add to the practicability of the heavier-than-air machine.

The dirigible has held its own against the competition of the aeroplane. Stability, speed, carrying capacity and radius of action, have all received attention and improvement. (Several types, generally well known, are discussed.—Ed.)

Navigation by night is facilitated by the use of searchlights on dirigibles and aeroplanes, and by the establishment of light stations and luminous signals. Radiotelegraphic and optical means of communication are now largely employed.

#### VI.—The Armored Ship and the Trans-Oceanic Liner.

The great efforts towards things colossal in the domain of force are signally illustrated in the modern vessel of war, in which we are constantly increasing the power of the armament, the armored protection, the speed, and the displacement. The enemy must be annihilated in the shortest possible time. No longer do we think of boarding an enemy's vessel to fight. The battle of Tsushima opened at 6000 meters, and the recent battle of Doggerbank at 15,000 meters. The distance is not limited by the invisibility of the target. What is necessary is to destroy, or at least to disable an enemy quickly, and to accomplish this the destructive power of artillery is constantly being increased.

The *Majestic* class of twenty years ago, of 15,000 tons, is now being replaced by the *Warspite* and *Queen Elizabeth* class of 28,000 tons, with 28,000 h.p. turbines giving a speed of 25 knots, armed with 38 cm. guns in tur-

rets carrying 30 to 40 cm. of armor; and the *Arizona* and *Pennsylvania* class of the United States, of 31,000 tons.

However, not all the giants of naval architecture are devoted to war purposes. The famous *Great Eastern*, built in 1858, initiated the era of large construction. But this vessel was not in accordance with the spirit of her time. Neither siderurgy nor the intricate art of engine construction had reached the point where such a vessel was practicable; nor were harbor accommodations then suitable. In 1893 the Cunard Line launched the *Campania*; and in 1899 the White Star Line produced the *Oceanic* and in 1901 the *Celtic*; all of over 27,000 tons. These were in keeping with scientific progress. In 1905 the North German Lloyd launched the *Kaiser Wilhelm II* of 24 knots speed; and in 1906 the Cunard Line completed the *Lusitania* and the *Mauritania*, of 38,000 tons, with 68,000 hp. turbines giving a speed of 25 knots. In 1914 the Cunard and the White Star launched the *Aquitania* and the *Britannic* of 53,000 tons, speed 24 knots; and the Hamburg American the *Vaterland* and *Imperator*, of 57,000 tons and 24 knots.

In addition to increase of individual size the number of large vessels is increasing enormously. In 1891 there were only two of tonnage between 10,000 and 15,000; in 1911 the number having a tonnage greater than 10,000 was 136, twenty-six of them being greater than 15,000 tons, and two greater than 30,000; and in 1914, 190 were greater than 10,000 tons, thirty-one of which exceeded 15,000, three slightly exceeded 30,000, and four were of more than 50,000 tons. In the last fourteen years the power of the engines of these vessels has jumped from 14,000 hp. to 76,000 hp. and the speed from 20 to 25 knots.

The progress realized in naval architecture has resulted from the study of the mechanical features of construction, to balance longitudinal and transverse strength by means of double bottoms, bulkheads, and watertight compartments; from consideration of the theory and practice of propulsion, and of the screw propeller; from modification of the form of the hull to diminish resistance to motion and to increase stability; from the adoption, thanks to siderurgical advances, of metals of great static and dynamic resisting power, a guaranty of the solidity of the whole, and of generators, motors, and propellers; and from the increase in power of motors, not only in the absolute, but relatively to mass and volume.

The increase in power per unit of weight and volume of steam and electric motors is of paramount importance, since the resistance of water to the movement of a vessel increases with the square of the velocity, and the power of the engine to overcome this resistance must increase with the cube of the same velocity.

The maximum efficiency of turbine engines requires high velocity of rotation of the turbine shaft. This necessitates a reduction gear in coupling the turbine to the propeller shaft, since the speed of rotation of the pro-

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pellor must be less than that of the turbine. The Parsons system is one of the best, and has given a vigorous impulse to the application of turbine engines to marine use.

Internal combustion engines, with constant pressure, of the Diesel type, give high thermal efficiency, even for variable speeds, and have reached 3000 hp.

There is no present means of calculating theoretically, *a priori*, the amount of resistance offered by a fluid to the movements of solids of various shapes and dimensions, though it is known by experiment to be a function of velocity and of a numerical factor depending on the form of the solid. The theory of *mechanical similarity* is applied. In this there is a relation between lineal, superficial, and cubical dimensions, velocities, and homologous resistances of two solids in movement; and thus can be determined the curves of resistance by means of models in a testing tank.

Both naval and mercantile architecture have profited by these advances; and while, in time of war, every effort is applied to augmenting naval power, in time of peace commercial traffic is being extended more intensely, more actively, day by day, over every sea.

**VII.—The Torpedo and the Submarine—Progress of Submarine Navigation.**

Luppis and Whitehead first controlled torpedoes from shore by a cord, then passed to a submarine projectile that moved under its own power; and from these we have progressed to the modern automobile torpedo which rivals the cannon.

Formerly experts classed this weapon as of small value; but opinion has changed, due to perfecting the mechanisms of propulsion, stability and direction; to the substitution of cold compressed air for warm air, thereby increasing the range; to the employment of the gyroscope, giving the torpedo a rectilinear trajectory; to the hydrostatic piston and steering engine; to automatic speed regulators; and to increase of caliber and explosive charge, speed and precision. Besides, inventors have striven to make the torpedo superior to any defense; and with the power of explosion, to which has been added a speed of 300 m. per second, a projectile with a charge of 16 kg. can penetrate 110 mm. of vanadium steel at short range.

The effective reply to this weapon is the superdreadnought of high speed and heavy armament, capable of sustaining an action out of range of the torpedo. But, if these vessels accomplish the object of fighting out of reach of torpedoes which are launched from a ship above water, they are still vulnerable to the submarine, which can approach almost with impunity.

Some professional men have looked with disdain on the submarine. They have said that it is an imperfect arm, delicate, difficult to handle, only possible in a harbor or in a calm sea; that the torpedo rarely reaches its target; that vessels can avoid it by increasing speed; that the damage on striking is slight, thanks to double bottoms, watertight compart-

ments and safety nets; and that, at the utmost, all that is necessary for protection against the torpedo is to armor the bottoms and multiply watertight compartments.

The incidents of the present war have effectively replied to these assertions. And, on the other hand, there are those who go to the opposite extreme in their contentions. Laubeuf, the French naval engineer, founding his opinion on the recent combats in the North Sea and the blockading operations, maintains that everything favors the submarine.

Among English naval architects some believe that by armoring the bottoms with 100 mm. and remodelling the watertight systems an effective defense is obtained. But armored bottoms would enormously increase displacement, and it has not been conclusively shown that 100 mm. of armor would suffice. Besides, an increase in weight of armor must decrease the offensive and defensive power of the armament.

Increase of speed of vessels does not guarantee safety from submarines. The principal factor in its attack is surprise, and vigilance of watch does not afford sufficient protection.

The submarine cannot attack its own species, but those of another type, incapable of protecting themselves. Its crew must be highly intelligent, well instructed, audacious and self-sacrificing.

The present development of the submarine rests upon the practical solution of numerous scientific problems, such as hydrostatics, hydrodynamics, optics, acoustics, electricity in its multiple forms of application, chemistry, thermodynamics, and siderurgy. (See article for detailed discussion.—Ed.)

Thanks to these scientific advances the speed has reached 20 knots on the surface and 12 submerged; and the radius of action, on the surface, nearly 5000 miles, and 140 submerged.

Living conditions for the crew are now good. Comforts and amusements are provided, and appliances for navigation have been perfected to facilitate ease and certainty of handling.

Nor has the submarine application solely in war. Scientific problems of geography, hydrography, and paleontology can be at least partially solved; and the commercial submarine can undertake the exploitation of the riches of the sea.

**VIII.—Explosives—Their Progress—The Principal Centers of Scientific Investigation—Application in Peace.**

Empiricism, which for a long period prevailed in the fabrication and employment of explosives, has given way to the advance of the thermochemical and thermodynamic sciences. Theoretical study, aided by precise experiments in chemical physics, has led to the knowledge of the products of explosion as derived from the explosive material, and to an understanding of the chemical reactions, the temperature resulting, the volume of gases, pressures, and, in general, the potential characteristics.

We are not so far advanced in our knowledge of the dynamics of explosives, that is, the phenomena which accompany the change of

chemical equilibrium between the initial and final instants of the explosion. In other words, we cannot yet calculate theoretically the rapidity of decomposition and the amount of initial work required of the fulminate, whether the latter be in the form of heat or mechanical energy. Hence the necessity of experiment, having for its object the co-ordination of the practical with the theoretical results, and the comparison of the useful effect of an explosion with the maximum work of which it is theoretically capable; thereby ascertaining the most favorable characteristics for efficacious employment, with guaranties of safety in fabrication, transportation, and preservation.

The list of known explosives, both of organic and of mineral origin, is long. Some are definite endothermic or exothermic compounds; others are formed of gaseous, liquid, or solid mixtures of explosive substances or of substances which, separately, are non-explosive.

Methods of rendering explosives less sensitive to heat, friction, and shock are being devised; and greater safety is now assured from gaseous products of explosion in galleries, tunnels, and poorly ventilated chambers. By the use of better materials and by improved methods of manufacture, the resisting power against dampness, heat, and cold has notably increased.

The centers of investigation of the phenomena of explosion are not limited to laboratories and offices; the opportunities for study are open to everyone; and in no country has the activity of investigation been more evident than in Germany. There the great industrial enterprises, under the fostering care of the government, have prosecuted the study of explosives vigorously and societies have been founded to this end. The influence of such establishments is easily understood. Small laboratories, although well provided with material, can work with only small quantities of explosive; while the larger establishments have unlimited opportunities for experiments on a large scale.

The word *explosive* always conveys the idea of destruction, and this is especially the case at present, as evidenced by the multiple forms of munitions of war. But it must not be forgotten that explosives give eminent services in peace. The variety in potentiality and speed of detonation, producing simple dislocations or trituration as may be desired, extends the field of useful application; and throughout the world great engineering works are developing with marvelous rapidity.

#### IX.—Chemistry.

This is one of the oldest sciences and, in its effects, one of the most modern. Its intervenes pre-eminently in scientific progress of the art of war. It is now adding to the destructive effects of the projectile the deadly asphyxiating gases of bromine, chlorine, sulphuretted hydrogen, peroxide of nitrogen, and others heavier than air, difficult of diffusion in the atmosphere and of poor solubility in water, which, under the impulse of the wind, roll along the surface of the ground,

invade trenches and widen the zone of death.

Notwithstanding its destructive application, chemistry is the most humane of the sciences, the one that labors most for the good of the race, and which has revolutionized the world by the creation of a thousand industries and the production of countless medical remedies.

The present war has evidenced the great economic industrial importance of chemistry. The blockade has compelled the substitution of materials at hand for others heretofore imported. The lack of copper and brass for shells has been remedied by the use of alloys of iron which by special treatment acquire the necessary malleability for brazing and moulding. Gasoline and petrol, employed in internal combustion motors for mechanical traction, have been replaced by benzol and by hydrocarbons, mineral essences extracted from coal tar by synthetical processes. The lack of nitrates and pyrites to produce nitric and sulphuric acid, indispensable in the manufacture of explosives, has been remedied by using nitrogen from the air and by barium sulphate. Aluminum is being obtained from clay, and cotton is replaced by ordinary cellulose. Chemists are even conducting experiments to fulfill one of the greatest wishes of humanity—to supply synthetical alimentation; in other words, to produce food by purely chemical processes. This means the disappearance of misery from the earth, and the advent of an era of abundance.

X.—*Sciences which conserve the human race and increase its energy—Medicine and surgery—Scientific laws of work—Actuarial science and war insurance.*

On surveying rapidly the vast field of science, it is seen how its ramifications invade and modify human struggles by increasing the number and power of weapons and extending the field of battle. But there exists one among the positive sciences whose field is solely that of benefit—the science of medicine. It utilizes great discoveries, not to aggravate wounds, but to cure them, not to spill a drop of blood except to stanch the flow.

In its mission of preserving, prolonging, and defending life, it places all other sciences under contribution. Military medicine, with their aid, has performed marvels; it has compressed an entire pharmacy into an individual pouch; has placed a pouch in every haversack; and has converted each soldier into a physician for his own aid and for the aid of his companion. In every ambulance there is a hospital; pack animals transport radiotherapeutic and fluoroscopic laboratories; and, under fire on the open field of battle, first aid stations are set up and operated. Field surgery is a wonder.

But medicine has a field still vaster than this; it is that of the infectious and contagious diseases which campaign conditions develop. Dysentery, typhus, smallpox, and all the other plagues that follow an army and scourge a people are the objects of brilliant attack by medical science.

The field of human industrial activity is comparable to a field of battle and presents

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its thousands of wounded and sick; and here, likewise, medical progress is manifesting its value. Industrial hygiene teaches the workman and operators to use ventilation, to regulate humidity, temperature, and lighting; to avoid the noxious effects of gases, vapors, dust and organic and metallic detritus; and mechanical and physiological means are practiced to avoid unnecessary fatigue.

In animal, as in inanimate motors, the energy consumed is calorific; it must be supplied and replaced by combustion; and the proper quantity and variety of materials of alimentation are indicated by scientific study. In the rational use of human energy we are concerned in the conservation of the living machine; and, to this end, modern scientific studies of work are directed not only to obtaining greater production, but to minimizing fatigue. Hence the installation of machines and apparatus reducing the useful force necessary to effect the purpose, and to eliminate useless muscular and nervous strain.

Actuarial science, which is a branch of applied mathematics, is the basis of life insurance. The present war is giving insurance a crucial test, and it is gratifying to note that, in France, the moratorium has never been extended to the payment of policies. (See article for detailed discussion.—Ed.)

**XI.—*Intervention of Science to Diminish the Evils of War.***

Tesla considers humanity as a mass  $M$  impelled by a force  $F$ , which must overcome a retarding force  $R$ , in opposition. Human energy is a function of these three quantities; it increases with the mass and the force of impulsion and diminishes with the resistance. The increase of  $M$  is obtained by whatever tends to increase human life, and that of  $F$  by intelligence and instruction.  $R$  is increased by attrition, lack of co-ordination as a result of ignorance, and by other negative forces, the most potent of which is organized war.

Not all agree with Tesla. Delafosse says that peace is not a perpetual benefit. The habit of enjoying well-being and security with no concern for their source relaxes man's careful vigilance and regenerating struggles, and necessary precautionary abilities are atrophied and perverted by inactivity, as still water becomes turbid while that of streams is limpid. Bernhardt and Theodore Roosevelt maintain that humanity derives its sustenance through work, and that war is an inevitable necessity. Yet, as Tesla affirms, war is a great retarding force for human energy.

How is war to be avoided? All the states that call themselves "great powers" found their claims on their formidable and perfect armament, and on their capacity to exploit defenceless nations; and find no other means of developing their moral, political, and economic grandeur than by the increase of territorial possessions.

Machiavelli said flatly: "All men are bad"; and Cajal adds: "By the fatal imposition of nervous inertia, our descendants will be as

perverse as ourselves. . . . Within twenty or thirty years, when the orphans of the present war are men, the same stupendous slaughter will be repeated."

The sciences, nevertheless, can supply arms to the weak to compensate for their numerical inferiority, since machines of war possessing great specific force, require for their manipulation a small number of men.

Tesla goes even further. He says that the present mechanism of war requires the hand of man for manipulation, and that, so long as men fight personally, there will be bloodshed; and to avoid this there must be an entire innovation in the art of war; man must be deprived of this bellicose exercise, and fighting must be carried on entirely by machines capable of playing the part of men,—automatons to which intelligent action is communicated by operators at a great distance. Twenty-five years ago he proposed a torpedo which could be directed from shore, complete in all its parts for movement, steering, and final explosive effect. Maxwell, Hertz and Branly had already discovered the principle of electric waves, and this application to automatic machines of war was not new. Branly called this system the "telemechanical wireless." Greater results have already been obtained than those dreamed of. Branly himself made notable advances. In the Trocadero, Paris, he caused movements of a semaphore, the raising and lowering of weights, the lighting and extinguishing of lamps, and the discharge of firearms, from a distance. His machine consisted of a small electric motor which transmitted wireless power. This motor caused the revolution of a "distributor axis," consisting of a small cylinder provided with several cogs that opened and closed corresponding circuits and operated an oscillator which, at intervals, emitted sparks producing the waves which were received at the distant station. This principle is easily applied to the explosion of mines, the destruction of bridges, factories, and fortifications; to fire cannon, open lock gates, etc., etc. In naval warfare its application can be even more general. Recent experiments tend to show the possibility and practicability of exploding not only such charges as have previously been prepared for detonation, but also to ignite masses of explosive at a distance without the prior preparation of the charge. Notable among these experiments are those by Gibbon, an American, and his collaborator, Buw, who employ ultraviolet rays; and the Italian engineer Ulivi, who recently claimed to have solved the problem of discovering metallic floating or submerged masses at a great distance and detonating explosions which they contain. Ulivi's apparatus produces electric discharges, and is, if his claims are correct, truly a marvelous discovery.

The inventions of Tesla and Branly are not complete and definite, but are founded on scientific bases. We should be far from correct in considering these problems solved, but we must believe that they are of sufficient

importance to demonstrate what science is capable of doing.

In conclusion it may be said that, in the progress of the sciences, every possibility must be admitted, and that care must be taken in denials. What appears impossible may take place; and in all the conquests of the mind the utopia of to-day generally becomes the reality of to-morrow.

[Science and the Great War. By Prof. E. B. Poulton. *The Canadian Military Gazette*, Jan, '16. 700 words.]

The life of any nation which depends on science for its existence is seriously threatened when the national policy of that nation is dominated by politicians who have no knowledge of those sciences. Ultimate German defeat is postponed by permitting the export from Canada and other allied countries of cotton, fats and oils—all of which are essential in the manufacture of ammunition. One-third of German heavy-gun ammunition consists of nitro-glycerine and the only source of glycerine is fats.

It has been known that the food supply of the German people could not be met without imports, yet at the beginning of the war the Allies allowed that government to import vast amounts of valuable protein food stuffs.

The two reasons given to explain this blunder are, first, the natural feeling against starving non-combatants, and, second, sensitiveness to neutral opinion. In the latter the lawyer politicians erred grievously, for this policy has tended to lengthen the war.

It was due to the quick application of science that the Germans, failing in that part of the campaign for which they were prepared, were so successful in the trench warfare which they did not expect. Firm action based on scientific knowledge, rather than fighting, may yet bring about the final decision.

[The Strategy on All Fronts. *World's Work*, Jan, '16. 10,000 words. 8 maps.]

(A non-technical description of the campaign against Serbia, with the reasons that led to it, and of the situation at the end of the year on the French, Italian and Eastern fronts, respectively, and on what is called the "Turkish Quadrilateral," to-wit, Gallipoli, Egypt [Suez Canal], the Caucasus and the region of the Euphrates.)

[Campaigns as Spring Opens. By Frank H. Simonds. *The American Review of Reviews*, Mar, '16. 7000 words. Maps.]

### I.—The New German Offensive in the West

This was by far the most interesting development during February. Every one has asked if this new offensive, by far the greatest German effort in this section in the past year, is to be one more great attempt to reach Calais. There are two views of this: it is either a final effort to win a decision in the west, or to regain the ground lost to the Allies last spring and last autumn, so as to place

the Central Powers in better position to meet the Allied drive which is expected in the near future.

To support the notion that it is a real German drive there has been the widely spread rumor for months that such an attempt was to be made. The Belgian—Dutch frontier was reported closed, invariably a prelude to great military movements; and Russian reports are to the effect that German troops have been moved from East to West.

It must be conceded that success here would be a staggering blow to the Allies, and particularly to France. But is it possible? It does not seem so, since Germany is not only largely outnumbered on this line, but she will have to break through long stretches of practically permanent works in the face of a tremendous supply of material. She could not make headway when the British numbered 100,000; and it is not conceivable that she can now, when the British number a million. At the most Germany has not over two million men on this line; while the French have not fewer than 1,500,000 in their first line, in addition to her allies. On the surface the thing looks impossible; but the impossible is by no means unlikely, and prophecy is foolish.

### II.—An Offensive-Defensive

Conceding that a real offensive is unreasonable, might it not mean that the real aim is to prevent reinforcements being sent to Saloniki or to Suez? Apparently the fierce offensive around Ypres last spring was to prevent the English sending reinforcements to Gallipoli.

But turning to the specific local purpose, the explanation is not hard to find. The Allies are planning an offensive, and the blow is likely to fall north of Arras and in Champagne. When the German advance came to an end in the autumn of 1914 their lines rested on the crests of a ridge which rises abruptly from the Channel and extends east until it breaks down in the basin of the Scheldt, north of the Somme Valley. With the blows delivered by the Allies in this quarter during the summer and autumn of 1915 the net result was to push the German lines back from most of these heights, and with a gain of from one to two miles in some places the positions of the Allies will command the German works. It is reasonable to suppose that the next Allied offensive will be greater than the last, and if the German hold upon Lille and the vicinity of La Bassée can be shaken, their whole right flank in France will be threatened. Hence the Germans have tried to prepare for the coming storm.

### III.—The Spring Offensive

The German position in France is a deep salient, resting mainly on the fortified city of Lille on the right flank and upon the Argonne ridge, just west of Verdun, on the left flank of this portion of the line. In the center it rests on the Champagne hills, just north of the Aisne. These latter have been converted into fortresses. But just south of Lille and east of Reims there are points in the German line that offer a maximum of

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profit for a minimum of labor in the attack by the Allies. If the Allies can break through at these two points they threaten the German center in the same way that von Hindenburg and Mackensen threatened the Russian front in Poland. The Russians escaped by evacuating Poland, and so the Germans would have to evacuate France, with no halting place short of the Ourthe or the Meuse. This has been the Allied strategy since the battle of the Marne—to use the armies in Artois and Champagne as a gigantic pair of pincers.

But even if the Germans do not succeed in holding their present lines they may straighten them and still hold much of Belgium. And it is not inconceivable that they may still hold a line from their position at Verdun to Givet on the Franco-Belgian frontier, thence south of Namur across the Sambre-Meuse triangle and through Maubeuge to Lille. Although this would straighten their line, it would entail the surrender of almost all the French territory now held.

Again, they might retire to a line drawn west of Antwerp and Brussels, thence behind the Meuse to Verdun. Both of these lines are said to have been prepared, though the last position abandons the Belgian coast.

**IV.—More About Attrition**

Recently a member of the British cabinet read in the House some statistics tabulated from the reported German lists of killed, wounded, and missing. Though this statement was in no sense intended as a British estimate of German losses, but was merely a repetition of lists compiled in neutral countries from German lists, it was misunderstood both in England and abroad. As a matter of fact both the British and the French estimators calculate the German losses in comparison with their own, with the result that the estimates vary considerably. According to certain figures accepted as reliable by some well informed persons, the Germans have lost 3,000,000 permanently and they still have 5,000,000 available. It takes about 3,000,000 to hold their lines, and another million for auxiliary services, leaving a million of reserves to draw on before the decline in numbers at the front can begin. They apparently have been losing an average of 150,000 per month; hence it will be about seven months, from February, 1916, before the decrease will actually be felt; in other words, about the end of August, 1916.

Certain French figures, however, show that the period of exhaustion has already begun; and this latter estimate appears to be more nearly correct.

**V.—Russia Begins Again**

Late in January the Russians began a new offensive along the Dniester and as far north as the Pripet marshes. After moderate progress this was checked, but threatened to break out again late in Feb. The general supposition has been that in the spring the Central Powers would attempt to penetrate into southern Russia, and throw the Russians back from the Rumanian frontier; and having taken Bessarabia

would use this territory as a bribe to persuade Rumania to join them. The moral effect of Russian success in forestalling this would be evident. The immediate effect of the Russian offensive was to cause the recall of part of Mackensen's force before Saloniki to stop the Russians, leaving the Allies in peace to secure their hold from the Vardar to the Struma.

Another message which this conveyed to the world was that Russia is not yet crushed; and that she not only is not inclined to make a separate peace, but that she is getting ready to resume the advance that brought Austria so near to the verge of ruin before.

**VI.—Montenegro Is Lost**

Montenegro was quickly subdued after the fall of Serbia. Then came the report that her king had made a peace with the Austrians. This was believed for a time, but Nicholas fled to Italian soil, and amidst charges and counter-charges against him, it finally appeared that he had not betrayed his country, and Vienna tardily conceded that peace had not been made.

**VII.—Italy's Failure**

Italy showed no anxiety for the fate of Montenegro until the defeat placed in peril her prospects on the eastern shore of the Adriatic. The practical destruction of the Serbian army is partially attributed to Italy's refusal to send troops to her aid. There are those who profess to believe that Italy was willing to see Serbia crushed, so that there might be a less dangerous rival on the Adriatic. With King Peter's nation out of the reckoning, Italy might hope to consolidate her own hold on Dalmatia and Albania; but the debacle of the Montenegrins permitted the Austrians to penetrate into this region, with only a few Italians confronting them at Valona. If this place falls, Austria will be mistress of the eastern shore of the Adriatic from Pola to the Straits of Otranto. Cattaro has become the best naval base on the Adriatic, and Valona in Austria's hands will be almost as great a menace to Italy as Calais in German hands would be to Britain.

Austria and Germany are thus on the point of consolidating their gains in the Balkans. Save for Saloniki and Valona, they have cleared the peninsula of Allies, and even if Austria is eventually compelled to retire from the Balkans she may be able to make her retirement contingent upon the absolute freedom of all those states, and will thus eliminate Italy from all power on the eastern shore of the Adriatic. This is, of course, contingent upon the war being practically a draw. On the other hand, if the Central Powers are crushed, Austrian claims will receive but slight consideration.

The present war grew out of conflicting purposes in the Balkans. Permanent peace can be secured only by the independence of these peoples on an ethnological basis; and with guarantees from all the great powers both against each other and against outside aggression. All this will be impossible if Italy has her way, and recent events in that theater cannot but be pleasing to the most loyal friends of the Allied cause.



### VIII.—Peace Talk Again

A rumor attributed to a New York newspaper, recognized to be in close touch with the German Embassy in Washington, recently stated that Germany was willing to make peace on the following conditions:

The evacuation of Belgium without payment to Germany of indemnity or cession of Belgian Congo;

The evacuation of northern France on similar conditions;

The surrender to Great Britain of all save one of Germany's colonies (apparently German East Africa);

Poland to be a separate state, under Austro-German direction;

Serbia to be divided between Austria and Bulgaria;

Albania to be divided between Austria and Greece, the latter to receive part also of Macedonia;

The integrity of Turkey to be recognized, and Germany's economic supremacy therein to be conceded;

And Germany to annex the Courland province of Russia.

It is interesting here to note that, despite the fact that Germany has met no defeat, her claims as a basis of peace have greatly diminished. But the Allies are not expected to allow discussion of even these reduced terms.

[War Notes. By Captain H. M. Johnstone, R. E. (retired). *United Service Magazine*, Mar., '16. 4800 words.]

#### I

It will be a very simple matter for the German Zeppelins to reach Paris, throw their bombs, and start on the return journey before the French aviators in that city can reach a height which enables them to throw bombs on the Zeppelin itself. Since the Germans have given proof that they desire above all to avoid the loss of their machines, the best the allied air fleet can hope for is to expose the Zeppelin to grave danger during its retreat. As soon as the passage of Zeppelins toward Paris is signalled, all the units should converge on the routes which the returning airships would have to follow, while the planes of the Paris defense would give direct chase. They would therefore be able to use against it the tactics of trained cavalry, and harass it on all sides, aiming their guns at the crew and dropping incendiary bombs and arrows from above. The armament of our (British) airships is not, however, the best for attack on airships. At first it seems curious that craft of such enormous size form such a difficult target. But when it is two miles up in the air and moving swiftly, lighted up only by intermittent searchlights, it is extremely difficult for land gunners to make anything like an effective shot. For one thing, the means of gauging its height are far from perfected, and ranging on it is infinitely more difficult than would be the ranging on a similar object moving at the same rate on the

ground. If the Zeppelin does its best it can beat the aeroplanes both in speed of rising and its actual capacity for height. So there remains only the attack on the level by machine guns; but the airship's buoyancy allows it to cover crew, engines, and petrol tanks with bullet proof armor. The best weapon for the plane would be a light gun of two or three inch caliber, firing a light, hollow shell filled with a violent combustible, and perforated with a lot of holes, the combustible to be ignited as soon as the shell left the bore. One of these passing through a bag would set the whole on fire, whereas the thin bullet of the Maxim might pierce the bag in a hundred places without doing any harm. The difficulty is that the gun would have to be a light and short one, of short range therefore, and the plane would have to venture very near the formidable battery of the Zeppelin. The enemy's raids will cease only with the frequent destruction of the weapon he uses to effect them.

#### II

When the spring fighting begins, the Central Powers are likely to find themselves very hard pressed in the field, and to find also that the privations of their home populations are increasing during the final months of waiting before the next harvest. They hope that when the strain becomes too great they will have vast assets with which to bargain, but until the enemy troops are ousted from their territorial gains, the answer will be a decided "no." As to the probable date of this consummation, the premium against the risk of war being unfinished on the 31st December, 1916, stood at about 50 per cent.; that is, insurers and insured reckon the chance about even that 1917 will open in peace. In addition, money thinks there are about seventy chances to thirty that the fighting will have come to an end by June 30, 1917.

#### III

The month of work around Czernowitz and on the Strypa is of interest, since the Russians have attracted to that region, without any special strain on their part, a disproportionate number of German and Austrian men and guns. Some say the attack was first started by the Germans at the report of Russian weakness on the Bessarabian front, where a successful stroke would have rebounded greatly to the prestige of the Central Powers as well as affording a chance of future flank attack on Russia. But General Ivanov also concentrated his men and, being ready first, became the aggressor. His positions on the Pruth and Dniester were capable of improvement and this he achieved by his capture of Usciesko; this also enables him to cover the left flank of his dispositions farther up the Strypa.

Germany is believed to have all her men on foot up to the age of 45 and Austria to have warned men up to 55. They are now beginning to labor while Britain and Russia are only getting into their full stride. The disaster of the Erzerum sector will react on all

**EUROPEAN WAR—Continued**

Turks, and the Bulgars at Saloniki, being hungry, are beginning to grumble. Many of them are beginning to see that success with the help of Germany means eventual slavery.

## IV

It is clear that prospects of success and failure depend principally on the matter of numbers of trained soldiers, now that on all hands the output of munitions has been thoroughly regulated, and the Czar's Foreign Minister has recently said that the war may be finished by November with the exhaustion of Germany and Austria and the full victory of the Entente. It is much better not to count on internal depression in Germany as an aid to bring about peace, but to depend entirely on a victory in the field, which can be brought about only through superiority in numbers. To carry on a war of the present kind, a belligerent needs not only a sufficient force to keep his fronts manned adequately from flank to flank, but must keep on hand large units for use whenever the chance presents itself, or whenever he finds the enemy making a special effort. Starting at 9,000,000 odd as the original man-power of Germany up to the age of 45, an expert arrives at 770,000 as the number of men not yet utilized as soldiers and available to become such, after deducting casualties since the beginning of the war, and the probable number that have to be kept at production and transport work in the interior. The calling out of the able-bodied men up to 50 would raise the number to about a million, but the Germans have well over a million prisoners, whom, contrary to the agreement of the Hague Convention, they would force to work, each of the prisoners thus freeing a German for the ranks. When the final pinch approaches with summer, many of the men who are now employed in the manufacture of stocks for "dumping" when the war is over, will be trained as soldiers, as Germany cannot afford to be beaten in the field. Though a great many of them are very poor quality, they form another million and a half to be beaten. Of all the countries it is only the British, Russians and the Turks who still have plenty of free men of good fighting age.

## V

Though the beating of the Germans is undoubtedly to be accomplished in the West, there is much to be said in defense of England's campaigns in the Dardanelles, in the Persian Gulf region, and in South Macedonia. To have abandoned the Balkan expedition would not only have produced a most deplorable moral effect, but would have driven Rumania and Greece straight into the German fold. It would have enabled Germany and Austria to leave all Eastern affairs to their allies, with only the supervision of some German officers, and freed all troops for Russia, Italy, and France. By the Allies retaining their position in growing strength, Germany and Austria have to keep substantial forces in the south, have to run the chance

of serious friction with their two allies, Turkey and Bulgaria, and lose the chance of being able to provide adequate forces for their attack on Egypt.

## VI

Two dangers for the troops of the Entente are (1) the free run that exists at present between the Austro-Germans at Monastir and the Greek Headquarters at Larissa in Thessaly; (2) in the Western theater, where there is a probability that the enemy is preparing, against the east-wind season, some new villainy in the way of poison gas. The danger in Greece is due to the fact that King Constantine keeps his army fully mobilized, while his government continues to use language of notable ambiguity. An attack on the Franco-British rear is the more tempting since the force of the latter does not interpose between the Greek concentration at Larissa and the Austro-Germans at Monastir. The proper steps have not yet been taken for the discouragement of the Greeks, and one would like to see their army disbanded.

[The War: Its Military Side. By J. D. F. *Jour. Royal United Serv. Inst.*, May, '16. 25,000 words.]

(A chronological summary of the war from the beginning to include Apr 10, 1916, in Serbia, German Southwest Africa, Mesopotamia, Cameroons, Italy, and the Dardanelles. The references are mostly brief, and in general, cannot be further summarized.)

Despatches from Sir John Nixon, commanding the Indian Expeditionary Force in Mesopotamia, and from General C. C. Monro, commanding the Mediterranean Forces, are quoted in full. In the main, the substance of these reports has been abstracted heretofore from other sources and published in the *DIGEST*.—Ed.)

[Diary of the War. From 1st February, 1916, to 30th April, 1916. *Jour. United Service Inst., India*, July, '16. 10,000 words.]

(A brief chronological record, day by day, of the events, both military and naval, occurring within the period stated.)

[As a Correspondent at the Front. The War of Positions. By J. C. Guerrero. *Revista de Caballeria*, June, '16. 4800 words.]

Until recently the science of war knew only two fundamental forms: *field warfare*, and *fortress warfare*. The European war has brought to light a third form, the *War of Positions*.

The war of positions was born in France of German parents during the campaign of August and September, 1914. After a rapid and daring advance to the Marne, the invading armies of Kluck, Bülow and Hausen found themselves confronted by the enemy. The French Commander-in-Chief concentrated forces in the west for the purpose of flanking the German right wing. To avoid this danger the entire army was obliged to fall back. The withdrawal to the Aisne was effected in a

masterly manner. As it was impossible to confront the French in the open field with inferior forces, and as a continuation of the withdrawal would be disadvantageous both in a military way and politically, use was made of the fortified lines that the German engineers had prepared. The French in turn were unable to maintain themselves in front of the German lines without intrenching in a similar way. So was brought about, as a phenomenon of the campaign referred to, that third form of war known as the war of positions.

The opinion of the writer is that all future wars in which masses are engaged, as at present, will be wars of position. A description of the field fortifications should be of interest. The line of defense for the infantry is a continuous trench, well concealed and traversed at intervals of from 10 to 15 meters. Head or overhead cover is provided. Shelters for auxiliary troops and reserves are as near as possible to the first line. They are trenches covered with planks or brush and a heavy layer of earth. The troops are lodged in deep bomb-proofs branching out from the trenches. Communication trenches, similarly covered, extend from the supporting points to the first line. Means are provided to keep the trenches clear of water.

Machine guns are generally placed in the first line. When they can be sufficiently elevated they are often placed in rear.

The artillery is not less than 500 meters behind the infantry line. The guns are so well concealed that it is almost impossible for the enemy to locate them. Dummy batteries are frequently used. Artillery observation posts, carefully concealed, and fortified against shrapnel and shell are located on elevated places as close to the hostile lines as possible. Obstacles are always found in front of positions.

All parts of the positions are connected by telephone lines and means of signalling by light and sound are also provided.

Field railroads are used in the service of supply and for the evacuation of wounded. They are brought as close to the firing trenches as possible. Armored cars are also used in this service. Elaborate means are provided for observation.

High power telescopes, periscopes and searchlights are indispensable. Aeroplanes, airships and captive balloons are used to discover hostile positions and movements. The hangars are located far in rear, out of artillery range. Information secured by aircraft is sent to the proper headquarters by telephone or wireless. Special measures have been devised for fighting when the trenches are so close that the artillery can not be used. In places the hostile trenches are not over 30 meters apart. Trench mortars, gas and fire bombs and hand grenades are in constant use.

Cavalry finds no opportunity for mounted action in terrain so cut up by ditches and obstacles. It now fights as infantry or attacks on foot with the sabre.

Every effort is made to keep the troops fresh and in readiness for combat. Troops in reserve are trained and exercised as in time of peace. This is for instruction purposes as well as to keep the men in good health and spirits. In armies composed of men in an advanced state of civilization, it really is not the body but the *spirit* of the individual soldier that requires the most attention.

The following description of an attack should give an idea of the complicated machinery used in the wars of today.

"For two days and one night the enemy's artillery has been firing. The regiment has counted over 5000 projectiles. The fire is increasing instead of diminishing. Three French aeroplanes flew over our trenches for half an hour launching bombs. Five aeroplanes went up to meet them and drove them back toward the French lines. Of the five, three kept on far in pursuit. One was wrecked by a French shell, the others returned. The observers telephoned to headquarters that they had noticed an unusual activity in the enemy's lines. They could not give many details as the sun had set and observation was difficult.

"Our artillery replies to the French fire at intervals. Our infantry is on the alert, since artillery fire of such prolonged intensity can mean but one thing—an assault. Now the guards in the advanced trenches are doubled. Every now and then a rocket falls in the neutral zone illuminating this gruesome region for a time, but no movement of the enemy can be seen as yet. The howitzers and mortars continue to emit heralds of destruction and death from their invisible mouths.

"From an observation point an officer telephones back to the batteries. An instant later a tremendous explosion seems to rend heaven and earth as our batteries open fire. In the French positions none sleeps. The officers, watch in hand, await the moment designated for the assault. Like the patter of raindrops upon a window pane sounds the rapid fire of a dozen rifles in a small wood to the left front. It is a patrol of French engineers who have been discovered trying to work up under cover of the trees to cut openings in the wire entanglements. The French artillery fire, until now directed against the batteries, gradually draws near to the fire trenches. Grenades and bombs fall in an incessant rain of fire. The assault is about to take place. The radio telegraph operates without ceasing, communicating with the troops in rear to insure proper support. All of the telephones are in use and the bells ring continuously. A growing nervousness runs through the lines making the whole army seem like a single human organism moved by some strange electrical current. All the world is either in activity or in readiness. Sanitary troops pass by carrying back the wounded, patrols from both sides creep like thieves into the neutral zone and disappear. One patrol attempts to destroy obstacles and is itself destroyed by

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another patrol which in turn is blown into bits by grenadiers. The enemy's artillery bombards the roads leading from the rear in order to prevent the bringing up of supports and to cut us off from communication with headquarters. Hand grenades and bombs hurled by the trench mortars fall in such quantities that the infantry in the advanced trenches is forced to fall back here and there. The slaughter is terrible. Engineer patrols go out from time to time and hurriedly replace or repair parts of the entanglements destroyed by the shells. Less than half of the men return from this work. The cones of light from the searchlights illuminate the field—but no movement is observed as yet. Our watches are at 1 a. m. For the French it is midnight. A stentorian, 'hurrah!' comes from thousands of throats. It is the hour for the assault. Like a living wave, vomiting grenades and bombs, they burst from the trenches and sweep forward against our lines. Now they are in the neutral zone and now they wrench at the obstacles and with their bodies fill in roads across the *trous de loup*. Ground mines are set off throwing dozens of bodies into the air. The advanced trenches are taken. The German infantry counter assaults to retake these but in vain. The French hold on. In the little wood the guns are silent. The fighting is hand-to-hand with cold steel. Machine guns play without ceasing upon the living targets. The French artillery has ceased firing to avoid killing their own men. The German reserves draw near to the struggle; the bravery is superb, the losses, without end. Step by step the Germans advance. Centimeter by centimeter, millimeter by millimeter, the lost trenches are retaken. At the end the Germans recover all the trenches except those in the little wood where the French have fortified themselves with sacks of earth among the shattered tree trunks.

"The defeated troops return to their old positions having lost many prisoners and left mounds of dead and wounded on the field, otherwise everything is just about as it was before. Day comes and the golden rays of the rising sun illuminate the blood bespattered and powder-burned bodies of thousands of the fallen."

[Two Rivers That Will Be Famous. By Luigi Nasi. *Riv. Mil. Italiana*, July, '16. 1100 words.]

Almost all rivers, in all countries, have more or less fame, connected with military history. But two European rivers are destined to surpass all others in fame. They are the Meuse and the Isonzo. They will be celebrated not only because of the battles that have been fought on their banks, but also because they have been the scene of a struggle between different types of civilization.

Both will carry to the sea their messages of blood, of iron, of glory. Along the Meuse

will be heard the echo of the Marseillaise, along the Isonzo the Hymn of Garibaldi. Both their names will live as long as patriotism endures and heroism is celebrated in the world.

[Economic Preparations for Victory. By V. Monastirev. *Voenny Sbornik*, June, 1916. 2300 words.]

The author first considers the traditional distrust heretofore existing between Great Britain and Russia, due to fear on the part of the British nation that Russia had designs on the English possessions in India, and in addition that Russia intended to seize Constantinople at the first favorable opportunity, a political event in which England could never acquiesce. However, at the present time, Great Britain no longer fears Russian influence or designs on India; and as to Constantinople, this important city has actually been offered to Russia by her present allies. Furthermore, England is actively assisting Russia in the present war by furnishing large quantities of munitions of war of all kinds.

Consideration is next given to the action of the Allies during the campaign of 1915, in which Russia suffered severely, while three millions of British and French troops in France practically did nothing to assist in preventing the weight of the German attack from being concentrated in Galicia and Poland. This inaction was explained at the time in the English press and in speeches by various government officials of both France and England, as being necessary in order that the expected final victory might be properly prepared for.

The author believes that the Allies were justified in following the course of action they did, and describes the necessity of mobilizing all the industries of the countries engaged in the world war, the results of which are now beginning to become apparent, and in which Russia is at present profiting by the steady supply of materials of all kinds that are now finding their way to Russian ports.

[Notes On the Present War. By F. G. Gerhaliman. *Voenny Sbornik*, June, 1916. 1200 words.]

(This article consists of a series of notes giving the results of the author's observations during the present war. Some of these notes are:)

The strategical front of armies is now very great; as a result the strategical reserve must be located on railroad lines, and often far to the rear;

The great increase in the size of armies has correspondingly increased the difficulty in directing their lines of advance;

The strength of lines of battle is so great that it is almost impossible to break through the front; in consequence a decision should be sought for in operations on a flank;

In the original deployment of an army, the smaller part of the forces available should be used in the front and in the reserve; the larger part should be employed as a maneuvering reserve generally situated on a flank;

Field fortifications must everywhere be employed;

Artillery must invariably fire from concealed positions;

The use of cavalry in raids on the rear of the enemy's lines, either during the period of mobilization or during active operations, does not promise valuable results; the true use of cavalry in war is in its employment for reconnoitering purposes.

See also

CANADA—EXPEDITIONARY FORCE FOR EUROPEAN WAR

TACTICS—JOINT OPERATIONS—ARMY AND NAVY

—General Notes on Operations, by Theaters [War Notes. By Captain H. M. Johnstone, R.E. (retired). *United Service Magazine*, May, '16. 4000 words. One map.]

## I

The British front in France is something like 70 miles, and averaging ten men to the yard, including all arms and all reserves on the field, the total rises to 1,232,000. The inference that certain sectors of this seventy-mile front are specially adapted for a big offensive may prove absolutely false. One of the data from which to form an inference is the relative value of the railway facilities on the two sides at certain points. The British and the Germans have certain points at a safe distance in the rear from which rapid convergence of units and munitions can be effected towards desired points along the front line. The assailant, if intending a large offensive, will do his best so to direct his operation as to force quickly a way to points where the defender's means of convergence will be seriously interfered with. No offensive action has been taken up by the Allies at Verdun because it suits them that the Germans should expend men and shells and wear out their guns just at this time. A big offensive requires long and careful preparation, and it is not a preparation applicable to any sector at random, but strictly to a particular sector. From a general strategic point of view, the Verdun sector is not a choice place for a French blow, so it will probably not be made there unless there is the certitude that the Crown Prince's troops are so reduced as to give promise of early rupture under a heavy blow. But if it appears to the supreme command that the work of smashing the Crown Prince's army would be a very costly operation, as well as occupying a great deal of time, it would also be seen that the only result might be a gain of ground and the accentuation of the Verdun salient, without any hope of important strategic effect. Then there are other parts where a gain in ground such as would be of little value on the Meuse would have a rupturing effect to be felt over great stretches of the German line.

## II

It is estimated that Germany has in her possession 30 to 40 Zeppelins available for use in flying over the coast of England, the largest and latest of her models. Smaller and older ones to the number of a dozen or so are re-

served for land work in France, and possibly an equal number for Russia. A few are in the Balkans, and a considerable number of good ones are cruising over the Baltic and North Sea. Germany has thus as many as 80 in working order. Thirty Zeppelins, with an average of 20 men aboard each, an equal number for relief, crews of trained men at home, twice the number in training, and four times the number as mechanics in airship harbors, amount to nearly 500 skilled men, outside of the shops where new machines are constructed. Against this, England has to put on a widespread outfit of searchlights, anti-aircraft guns, seaplanes and aeroplanes. The personnel for all these is large, and most of it is engaged in purely passive defense, while the enemy has the advantage of being the attacker.

## III

The Crown Prince's present to the German nation, from Malancourt to the village of Vaux, paid for with a horrible mass of mangled men, is nothing more than 30 miles of a sort of outpost line. The loss of the whole of Caillette Wood would be more serious than the loss of Vaux, for the south end of the wood overlooks the whole of the ravine of Vaux from the north, and possession of it by the Germans would force the French to abandon the ravine and make their line along the height to the south, on which stands Fort Vaux. The French have showed that whenever an enemy gain is really dangerous, he can be ousted from it at once.

## IV

The Germans are finding it more and more difficult to make a simple, decisive attack. They have counted on producing this situation by a deluge of shells, which would not only ruin the opposing trenches and destroy or demoralize the infantry defenders, but would have power enough to silence the defending artillery. They have been continually failing in this last particular for months, with a ghastly carnage as a result. The French line runs east and west at 350 yards south of the village of Douaumont and eastwards into the Caillette Wood. The enemy first tried to reach the head of the Vaux ravine across the open ground towards the Farm Thiaumont, but found that too difficult. He then made a half-successful attempt by the Caillette copse, but lost most of it again. At the same time he tried to improve his position by an effort down the gully that descends from the Douaumont plateau and debouches above a pond. This, too, failed, leaving every artifice of maneuver tried in vain. If any one of his efforts had succeeded, the fort and plateau of Vaux might now be in German possession.

## V

The strength of an army in the field is not alone a matter of number of men and guns, nor in the natural and artificial strength of the position occupied, but there is the discovery by the unsuccessful attacker of unexpected skill on the part of the opposing chief, and of unexpected toughness of fiber in the

**EUROPEAN WAR—Continued**

opposing troops. Though the German attack at Verdun was well planned and well begun, it could not be in the nature of a complete surprise. By the end of the first week, owing to a fine skill in their defensive operations, the French were gaining some control of the operations. If the Germans made any error in their tactics it was in not attacking up the west bank of the Meuse at the same time that they made their successful push on the front from the river to Ornes. They wasted many thousands of men and a million shells on the Douaumont plateau and at Vaux, where a success would only mean the pushing back of the French without any rupture of front, while a successful advance through the Côte du Poivre would have had the added effect of forcing the French to retire from the region of Douaumont. At the time of the Verdun attack, the Germans were probably meditating another great attack at some other part of the front and taking troops to that region. Since they thought the number at Verdun sufficient, they reassembled their reserve forces too late to have any important effect on their drive.

**VI**

The Russians have progressed in the east to within a score of miles of Trebizond. For the defense of the seaport, the Turks are said to have as many as 90,000 troops, but there is an idea that these are ill-supplied in every particular of food and munitions. One concern of the Turks at Trebizond will be to keep in touch with the central road from Erzingjan to Sivas and Angora. The southern column has from Bitlis been clearing the country south of Lake Van, and has found that the enemy is concentrating about Diarbekr, on the headwaters of the Tigris. Lately there are indications that Russian troops are appearing in the region from Mush or Erzerum, and the Turkish force at Diarbekr should soon be taken in front and flank. The Russians, using their fleet with skill and daring, have effected the outflanking of Trebizond on the north side, and thus succeeded in capturing it.

[War Notes. By Captain H. M. Johnstone, R.E. (retired). *United Service Magazine*. Sept. '16. 4000 words.]

(Comment on current events.)

[The Dobrudja, The Salonika Front, Fighting at Halicz, The Western Front. By Hilaire Belloc. *Land and Water*, 14 Sept. '16. 5700 words. 7 sketches.]

**THE DOBRUDJA**

The interest of the past week undoubtedly centers in the Dobrudja—an open, undulating parallelogram of land about 100 miles by 200 which lies south of the delta of the Danube and is contained between that river and the Black Sea.

The fact which gives importance to the Dobrudja in this campaign is that the Danube is a particularly formidable obstacle in these its lower reaches, and that this obstacle is

turned at one point only—the great railway bridge of Cernavoda. From the railway bridge at Belgrade, passing the Iron Gates, all along the 250 miles and more that separate Bulgaria from Rumania, there is no bridge of any kind across the Danube until one comes to that great avenue of communications which is called the bridge of Cernavoda. The lower Danube is a formidable obstacle for four reasons. First its depth, secondly its width, thirdly its rapidity, and fourthly, the fact that, save at rare intervals, it is flanked by great belts of marsh. Had bridges been established across it at various places in the past the Bulgarians at the beginning of the campaign would have seized a bridge-head, if it were possible, just as the Rumanians have seized the passes across the Carpathians.

A river like the Rhine or the Vistula, broad, rapid and often deep, but with firm banks, for the most part depends for the crossing of it upon a certain volume of fire coupled with the power to feint fire here and there and so to disperse the resources of an inferior enemy. But such feinting, such crushing of the opposite bank with superior weight of metal, and such secure establishments of a temporary bridge of pontoons or boats, depend upon the possession of very considerable forces, of good lateral communications up and down the stream, and, above all, on the existence of good going on each of the opposing banks. The great belts of marsh are fatal to such a scheme. The absence of a lateral road and railway adds to the difficulty. A railway bridge could not be thrown across the lower Danube with any rapidity, and it is upon railway communications that modern armies depend. All this lends supreme importance to the bridge of Cernavoda. Through their possession of this bridge the Rumanians were able to turn the obstacle of the Danube. The Bulgarians already had a great mobilized army in being, and ready to act in considerable masses in any direction and at any moment. They used it for marching against the bridge of Cernavoda. The strategic success or failure of the Bulgarians must be judged by their ability to reach and to hold, or to destroy this structure which turns the obstacle of the Danube in favor of the Allies. The Bulgarian army is following the bank of the river. They have taken Turtukai and Silistria. The bridge is but another 40 or 50 miles away.

At Turtukai the Rumanians had a division with certain extra units. The Bulgarians defeated this force capturing some 15,000 prisoners. The place was surprised, cut off from the east and surrounded. It is to be presumed that the force occupying it, except perhaps a few unimportant fractions, was either killed, wounded or captured.

Turtukai was completely occupied on Sept 7th. The Bulgarians then marched rapidly to Silistria and occupied it, the Rumanian division which held it withdrawing in time to escape. At the present moment the Bulgarian advance down the Danube appears to have halted. Contact was made on Sept 10th

between the Rumanian and Russian forces on the south and main Bulgarian advance. Russian patrols have been reported as far south as Varna which, according to reports, is being evacuated by its civilian population.

#### THE SALONIKA FRONT

According to the last dispatches, both the French and the British have made local advances on this front. The British, on the extreme right, crossed the Struma and established themselves on the further bank. The French made a sharp local attack and carried the Bulgarian first line trenches on a front of about two miles.

#### FIGHTING AT HALICZ

The latest bulletins indicate that the road bridge at Halicz and the railroad bridge of Jezupol have been destroyed or made unusable. The capture of Halicz will mean that the extremely advanced center of the enemy near Brezan will be in peril. The enemy, who are there heavily massed, are probably fighting a rearguard action preparatory to a further retirement towards the Neva-Dnieper line, but the occupation of Halicz would mean more than another few miles advance along the enemy's right flank. It would mean the breakdown of those successive resisting points which the enemy has established upon the way up the Dniester Valley to Lemberg. The real value of the capture of Halicz is comparable rather distantly to the value of what has been happening on the Somme front. It means that the Teutons cannot permanently stop the Allied advance and that the offensive, after each interval of preparation, strikes and succeeds.

#### THE WESTERN FRONT

Combles will be the next victim of the French and English blows in the near future. The British line now threatens that very strong bastion from the north. The Somme offensive is not an advance. It is a pounding. This tremendous battle is by far the greatest concentration of energy to be discovered anywhere at present throughout all the theaters of the war. The strain upon the enemy here is such that it has compelled him to put on this short front of 30 miles first and last, 50 divisions, and to hold it with never less than about one division per mile.

See also

WESTERN THEATER  
CHAMPAGNE, BATTLE OF  
VERDUN, BATTLE OF

#### WESTERN THEATER

[War Notes. By Capt. H. M. Johnstone, R.E., (Retired). *United Service Mag.*, Nov, '15. 6000 words.]

(Note.—This installment discusses principally the results of the Allied drive in Artois and Champagne, and the possibilities of the Serbian situation. These phases are covered in the record of events in the European War.—Ed.)

[Operations of the Belgian Army, July 31-December 31, 1915. Abstracted from "L'Action de l'Armée Belge, Rapport du Commandement

de l'Armée." By Capt. O. E. Hunt, Infy. *Infantry Journal*, Feb, '16. 7600 words. Sketches.]

(Abstract of the above report appears in the INTERNATIONAL MILITARY DIGEST ANNUAL, 1915, page 132.)

April

[German Movements on Western Front. From our French Correspondent (under date of Feb 4, 1916). *Army & Navy Jour.*, Mar 11, '16. 700 words.]

Despite the extension of operations elsewhere, the decisive blow will be struck on the western front. The French army has steadily increased in efficiency and equipment since the Marne, and will soon receive 450,000 trained recruits from the 1916 and 1917 class and 150,000 colonials, not to mention the British force and its increments. German reinforcements have been flowing westward steadily of late, and they are now estimated to have 1290 infantry battalions on the western front. Germany has 900,000 trained reserves in depots, in addition to 800,000 young men of 16 and 17 under training.

France publishes no casualty lists. Casualties average 1000 daily on a 50-mile front. On the offensive, the Germans have suffered heavy losses, and their estimated casualties are 200,000 per month. A Swiss authority estimates the German losses in Champagne and Artois fighting in September at 300,000. As demonstrating the inaccuracy of German casualty lists, it is stated that in a certain corps 70 per cent. of the prisoners now detained in France have never been mentioned on the lists. (This might mean much or little.—Ed.)

The French learned valuable lessons in the Champagne offensive. More elaborate artillery preparation and a reserve of long-range guns are necessary. Success favors the side with reserves in men and guns handy for use. Speed and mobility remain the deciding factors even in siege warfare. Light guns for trench work are now in use.

[With the British Army. Second Series. Letters from H. S. Gullett, official Australian correspondent at British H. Q. in France. *Australian Mil. Jour.*, Jan, '16. 9500 words.]

(Consists of a series of letters under dates from Sept 1 to 12, 1915. These letters give a vivid picture of conditions. Only occasional points are touched.—Ed.)

The fighting on the British front, at first undertaken in a sort of sporting spirit, hardened to bitterness on the sinking of the *Lusitania*. Now the British force the deadly character of the fighting.

The Germans are wonderfully good at trench work and guard their soldiers' lives carefully. The communication trenches are especially good. This fact, and the liberal use of machine guns, enable them to hold the lines with very few troops exposed. The trenches are formidable and grow daily in strength. There are more than 100,000 miles of trenches in France and Belgium.

**EUROPEAN WAR—Continued**

The area behind the lines has become more dangerous as the war progresses. Trench life in summer is disturbed by swarms of flies, and often lice are troublesome, but even so summer conditions are far preferable to the mud, slush and cold of winter.

The French and English have taught each other the art of making trenches. The French excel in dugouts and communications, and are careful of their soldiers. The trenches are masterpieces of careful execution to have been so hastily built. The familiar claim is made that too safe trenches kill the offensive spirit of the men. Many of them become fatalistic in their attitude through the continual manifestations of blind luck in occurrences in the trenches.

A lot of nonsense is talked about scrapping the rifle. Bombs are important for short range work, but the usefulness of the rifle is unimpaired.

There is comparative calm in the trenches in the early morning. The men are glad to breakfast in peace.

The men in the trenches work like coolies. The job is never finished. The trench is never as safe or as dry as it ought to be, and there is continual damage by the enemy. There is no glamour about the life. There are no flags and no bands. If singing is done, it is over a considerable front so as not to draw fire to one spot.

The cavalry saved the British army in the early operations, but now the outlook is not bright. The trenches and barbed wire have introduced conditions impossible for mounted work. The Boer War shook the faith in shock tactics, but the short rifle restores the dismounted fighting power of the cavalryman. The German cavalry operated as in the Franco-German war, but less successfully. Their success was hampered by wireless and by the aeroplane.

In France, the cavalymen have been confined to the roads until the crops are harvested, but the roads are pretty well occupied by automobiles, motor cycles and great motor lorries.

[The French Offensive in Champagne (Sept-Oct, 1915). By Capt. X, of the French Staff. *Scribner's Magazine*, May, '16. 5000 words. Two maps.]

In Aug. 1915, after a year of war, the situation may be summed up as follows: The German offensive against Paris had been stopped by the battle of the Marne; six weeks after that time the furious drive against Calais was also effectively checked; local attacks in the Argonne had yielded no result; despairing of decisive success on the western front, Germany had turned the weight of her offensive against Russia, had regained and mastered a considerable extent of territory, and had the Russians in a difficult position; and it was clearly desirable to create a diversion on the western front.

The French offensive in Artois had shown that an attack could achieve success, and Brit-

ish reinforcements were available to substitute for and thus release French troops.

The substitution of one force for another is a very delicate operation. The solidity of a front is assured by an intricate combination of precautions and previsions. This is particularly true of the artillery, for which elaborate preparations are necessary to insure that fire may be delivered on a moment's notice, day or night, at any desired point of the front. Yet such a substitution had been carried out with complete success, and at last supplies of ammunition were at hand.

The ground chosen for attack extended from Auberville to a point east of Ville-sur-Tourbe, a front of about 25 km. Going east from Auberville, the German position showed a glacis-like slope for the first 8 km.; then ran around the rim of the hollow, at the bottom of which lay Souain; north of Perthes was a level stretch of 3 km., with the "buttes de Souain," hills 193 and 201, and the "butte de Tahure" in the background; north of Mesnil was a very strong position; north of Beauséjour is a bare stretch of easy country sloping up gradually; and finally, north of Massiges were the powerfully fortified hills 191 and 199, which look on the map like the pattern of a hand.

The German defenses comprised a first and second position. The first position consisted of three or four lines of trenches, covering 400-500 yards in depth, separated from each other by barbed wire entanglements. The second position consisted of a single trench with here and there a support trench. This second position and its barbed wire entanglements were built almost entirely on the reverse slope of the hill, where it was very difficult for the artillery to get the range. In addition, wherever the ground permitted, little organized centers of resistance and nests of concealed machine-guns had been formed. The German troops had orders to cling to these to the last in case the other trenches were overwhelmed.

The first requisite for the attack of such a position is accurate and detailed knowledge of every feature of the position. This the French had.

The spirit of the French troops was keyed up for the attack. On the 22d of September the artillery preparation began, and continued with terrific intensity for three days. It was directed against all of the elements of the German position. The infantry attack was set for 9:15 a. m. Sept 25, and the preceding night the troops moved into position.

The troops emerged from their trenches at the preordained moment. To insure cohesion, each section was marshalled into line when it reached open ground. Thus was formed the first wave of infantry, to be succeeded by others. The speed of the advance was so great that the Germans were in most places taken by surprise. But the gains were not uniform. South of St. Souplet, the German second position was penetrated on a front of 500 yards. Approximately equal progress was made north of Souain. The Sabot wood offered desperate resistance, but was finally



captured, and contact gained with the German second line on Sept 28. Between Souain and Perthes sterner resistance was encountered. Thick weather hindered the artillery support, and the German line was supported by effective fire from the "buttes" of Souain and Tahure. On this front the German second line held. North of Mesnil the German defense was successful and practically no impression was made on the first position. North of Beauséjour a swift success was scored. It was here that two squadrons of hussars galloped through the opening, dismounted and fought on foot in support of the infantry.

The heights of Massiges were taken after desperate fighting lasting for eight days.

The net result of the great offensive was the capture generally of the German first line of trenches, and an advance to the second line, the latter even having been penetrated on short fronts in three or four places. Twenty-five thousand men, 350 officers, and 150 guns were captured. More important still, the offensive caused the recall of ten or twelve divisions from the Russian front. The check of the German offensive in Russia coincided exactly with the French offensive in Champagne.

[The War of Movement of 1914 in Belgium. By Major T. E. Compton. *United Service Magazine*, June, '16. 3200 words. 1 map.]  
(Historical, with dates of events.)

[The War of Movement of 1914 in France. By Major T. E. Compton. *United Service Magazine*, July, '16. 3600 words and one map.]

(Historical, principally chronological order of events.)

[The War on Land. By Military Officer. *The Army & Navy Gazette*, London, Aug 26, '16. 1000 words.]

Western Front:—Our joint operations of Friday to Sunday have been the most fruitful of any since the beginning of the battle of Picardy.

In addition to gains of position and a substantial haul of prisoners there is the promising fact of delay in the customary offensive return of the enemy who sedulously prepared and keenly defended one of his positions later abandoned. When we enter and organize or occupy one of the enemy's works we find them severely damaged by our artillery fire.

The bayonet men and bombers, who have seized the ground, are closely followed by working parties, whose utmost efforts, cannot in less than many hours, render the débris and defense of the most moderate value.

The covered communication to the supports and reserves in rear, are for the moment non-existent, and if old ones existed they are broken in and filled up at many places. Before a new position can be reckoned comfortable this must be attended to. The enemy's offensive return must be made as soon as possible, and unless he does this, he must have been dis-

organized, and must have used up his supports and reserves for a long way back.

Either this must have occurred or the moral state of his mind has so suffered that they can not be induced to plunge again into the furnace without rest and reinforcement, and in extreme cases must be entirely replaced by new troops. During the week end just past, most of our work was done on Friday and no important efforts at recovery were made for thirty-six hours.

At noon on Sunday the real offensive return began but as we had had all those hours for consolidation, our gains were held.

These gains are numerous and valuable. On Friday we set foot "on the slopes of the high ground north of Pozières from which we get an extensive view of the east and northeast." On Saturday this advance was improved and we gained "on both sides of the Pozières-Bapaume road for 300 yards northeast of the Windmill." These new positions must already look down upon Courcellette and Martinpuich within moderate rifle range.

The French were simultaneously doing good work both north and south of Maurepas but progress for some time must be slow for both of us. The German command realizes the importance of all of this as indicating whether or not the tide has really turned. They may even themselves launch a heavy attack any day, in accordance with German strategical tradition, but for this General Joffre is doubtless quite prepared. In attacking at Verdun he is doing the best possible for the prevention of any undue activity on the part of the Germans.

[The Invasion of Belgium. By Col. Feyler. *Land and Water*. 24 Aug, '16. 2200 words.]

The question of the invasion of Belgium remains one of the most absorbing among the historical problems raised by the European war. The German official theory lays the responsibility upon the Belgians themselves in that they violated their own neutrality and thus forced the German army to protect itself against the trap they had laid by occupying their territory. It is interesting to examine whether strategical principles, and the German doctrine of their application, will support this theory. The preparation for the war of 1914, excepting of course the fixing of the date, beyond doubt began as soon as the Treaty of Frankfurt established the new frontier line. At that moment the Prussian General Staff started work on what might be called the *scientific* or *dogmatic* history of the war of '70-'71. An attempt was made in this work to show how war should be scientifically organized, leaving practically nothing to chance, and securing victory by the very perfection of theory and practice. The victorious Moltke of 1870 was thus made a prototype for the present war. His success proved irrefutably to the German mind that the German theory of warfare, based first and last upon superior organization, would infallibly lead to a complete German

**EUROPEAN WAR—Continued**

victory. Forty years of military literature impressed this view upon the minds of officers. Upon this theory then the General Staff prepared the flank movement across Belgium. The scheme had been organized for years and when the moment came one pressure on the button sufficed to set the whole machine in motion. The development of the intention to move through Belgium could be followed from 1870 to 1914 by noting the variations in the zones of concentration for the armies as betrayed by strategic railways, stations and platforms. When the French strengthened their Eastern frontier the Germans tended to abandon their original bases at Strassburg and Metz and to prepare for concentration on the Luxembourg frontier, and even further north right up to the Dutch line. French writers followed this evolution closely. In *Neutralité Belge et Invasion Allemande*, published in 1914 on the eve of hostilities, Senator Maxime Lecomte and Lt.-Col. Camille Levi foretold the operations almost exactly as they took place. In a chapter headed "The Germans will pass through Belgium" they examine the why and the how. *Why?* Because of the weakness of the northern French frontier compared with the eastern (for the French had long relied on Belgian neutrality to protect their northern flank). *How?* Through the *whole* of Belgium, for the size of the first line armies would involve a crossing of the Meuse, without which this right wing could hardly succeed in its attempted envelopment of the French. For many years past the violation of Belgian neutrality must have been written in the *dossiers* of the German Staff. It is obvious that so enormous an operation was not improvised by the Germans on the spur of the moment.

See also

CHAMPAGNE, BATTLE OF  
EUROPEAN WAR—RUSSIAN EXPEDITIONARY  
FORCE IN FRANCE

MARNE, BATTLE OF THE  
SOMME, BATTLE OF THE

VERDUN, BATTLE OF

VERDUN—OPERATIONS AGAINST

**EASTERN THEATER**

[Twelve Months of the War on the Eastern Front. Anonymous. *Journal of the United Service Institution of India*, Apr. '16. 12,000 words. Nine maps and plans.]

The Russians contemplated a simultaneous invasion of East Prussia and Galicia in 1914, and accordingly, concentrated in three areas:

1. Behind the Niemen, Bobr and Narew from Vilna to Warsaw;
2. At Lublin; and
3. In Volhynia and Podolia.

A Russian concentration in Central Poland west of the Vistula and an offensive from there were impossible before the enemy had been cleared out of East Prussia and Galicia, which hem Poland in like the jaws of a pair of pincers.

For the invasion of Galicia, the Russian forces were disposed as follows:

(a) The 1st Army, 400,000 men, under Ivanoff, on the line Lublin-Cholm;

(b) The 2d Army, 300,000 men, under Russky, about Dubno; and

(c) The 3d Army, 300,000 men and five cavalry divisions, under Brussiloff, east of Tarnopol.

The Austrian forces were disposed as follows:

(a) The 3d Army, strength unknown, under Archduke Joseph Ferdinand, at Cracow;

(b) The 1st Army, seven corps (350,000 men) under Dankl, at Przemyśl;

(c) The 2d Army, 5 or 6 corps (300,000 men), and five cavalry divisions, under Auffenberg, east of Lemberg.

Dankl and the Archduke advanced northward on Aug 10, 1914, the Archduke's line extending from Kielce to the west bank of the Vistula, and Dankl's from the Vistula to Zamosc. On September 2d, Dankl's front covered 70 miles and extended from the Vistula, near Opole, to Zamosc. West of the Vistula and abreast of him was the 3d Austrian Army, the bulk of which had been withdrawn to fill the gap between the right of the 1st Army and Auffenberg, who was hard pressed.

Ivanoff moved on September 4th and struck Dankl's center and left hard, his own left thrusting back the Archduke, forcing both to retire behind the San, after suffering heavy losses. Ivanoff now joined hands with Russky, who, with Brussiloff, had been driving back Auffenberg.

On August 17th, the 2d and 3d Russian Armies advanced against Auffenberg, posted on the Bug and Zlota, first threw him back on Lemberg and then in the ensuing furious battle of that name, August 27th to September 2d, forced him to retire with a loss of 70,000 prisoners, and 200 guns to Grodek, where, meantime reinforced, he made an obstinate stand from Sept 6th to 14th. But he was overmatched and had to fall back on Przemyśl. On September 23d, with Ivanoff's approach to the Wisloka, the investment of Przemyśl was complete, Cracow threatened, and very nearly the whole of Galicia in Russian hands.

The Russians contemplated an invasion of East Prussia on two lines. To this end:

(a) The Niemen Army, 5 corps and 5 cavalry divisions, 250,000 men, under Rennenkampf, was posted between Kovno and Vilna; and

(b) The Narew Army, 5 corps and 3 cavalry divisions, 225,000 men, under Samsonoff, between Osowiec and Warsaw, behind the Bobr and Niemen.

To oppose these forces, the Germans had at first only three corps near Insterburg and one near Allenstein available, in all some 160,000 men.

The Niemen Army advanced on August 17th against the line Pillkallen-Stallupönen-Goldap, driving the Germans after stubborn resistance back on Gumbinnen and, finally, behind the Alle and on Königsberg. After occupying the northeast corner of East Prussia from Tilsit

to Allenburg and Nordenburg, *Rennenkampf's* offensive came to a stand-still.

Samsonoff advanced, on August 17th, on a front of 90 miles, in two columns, the northern from Osowiec on Lyck, the southern from Warsaw on Soldau, his right wing in two columns, one moving north of Lake Spirding on Frankenau, the other south of that lake via Johannesburg on Ortelsburg. On September 26th, when he reached the line Soldau-Allenstein-Rothflies, his two wings were some 30 miles apart, only the cavalry being in contact.

In less than four weeks, half of East Prussia, from Tilsit to Soldau, had fallen into Russian hands, and it seemed as if only the Vistula, from Danzig to Thorn, prevented their further advance. But this situation was soon to be changed by Hindenburg, whose name will live in future military histories of every nation. He planned to defeat the Russians in detail, his first objective being Samsonoff's army. Collecting some 160,000 men at Marienburg, on August 23d, Hindenburg struck Samsonoff's left at Soldau, on the 26th seized that town, cutting off Samsonoff's retreat to Warsaw, drove his left back on Neidenburg, and then turned against his right center at Hohenstein, driving the entire Russian right wing back towards Passenheim. Working around the right flank of the Russians, he completed their defeat by the 30th, and drove them back in utter rout on the only road left them, that by Ortelsburg and Johannesburg. The Russian losses amounted to 90,000 men, and of the five corps that originally formed Samsonoff's Army, only one and one-half escaped from the catastrophe. This was the battle of Tannenberg.

Hindenburg now advanced vigorously against the Niemen Army, which occupied the line Friedland-Nordenburg, and on September 11th, forced *Rennenkampf* to evacuate Insterburg. His front and left threatened from Angerburg and Goldap, *Rennenkampf* rapidly retreated and on the 15th recrossed the frontier with Hindenburg in close pursuit. He had evaded the disaster that befell Samsonoff, but nevertheless lost 100 guns and about one army corps in prisoners. He retired across the Niemen and took up a position between that and the Bobr from Olita to Osowiec. The Germans pursued via Augustowo on Grodno and via Lyck on Osowiec. On the 25th and 26th, they attempted to cross the Niemen by ponton bridges north of Grodno while heavily bombarding Grodno, but were defeated and retired hastily on Augustowo, where they were again defeated on October 1st, falling back to a line following, in general, the frontier from Wirballen to Grajewo.

On Aug 22d, while the Austrians were advancing on Lublin and the Russians were crossing into Eastern Galicia and East Prussia, the Germans, after taking Liège and Brussels, were attacking the Anglo-French Armies from Mons to Namur.

On Aug 26th, when the Russians were advancing to the battle of Lemberg and Hindenburg had begun the battle of Tannenberg,

the French and English were rapidly retreating from Belgium and the British Army was hard pressed at Le Cateau.

On Sept 6th, while the Russians were attacking Auffenberg at Grodek, and Hindenburg was moving against *Rennenkampf*, the Germans, after approaching Paris, turned south to attack the Allies on the Marne.

By the end of September, Przemysl was invested, the Russians in East Prussia had been driven back behind the Niemen, and, in the west, the Germans had fallen back to the Aisne.

The first German invasion of Poland was undertaken to clear up the situation and to remove the pressure on Cracow, the following troops being assembled for the purpose with Hindenburg in chief command:

(a) A Northern Army, 500,000 Germans, based on Thorn and Kalisch, with Warsaw as its objective;

(b) A Central Army, 500,000 Austro-Germans, between Czesochewo and Cracow, with Ivangorod as its objective; and

(c) A Southern Army, 300,000 Austrians, posted before Cracow, charged with driving the Russians back from the Wisloka.

A large part of the Northern and Central Armies was in reserve and took no part in the operations. The Germans claim that they sent only five corps (250,000 men) against Warsaw, and but seven corps (350,000 men) against Ivangorod.

On Oct 8th, the Northern Army occupied the line Lowicz-Lodz-Piotrkow, its left advancing toward Warsaw, under the guns of which its advance was checked. The Russians, meanwhile heavily reinforced, assumed the offensive and by the 20th the Germans were in full retreat, destroying roads and railroads so thoroughly as to check effective pursuit. By the first week of November, the entire Northern Army was back in Posen.

The Central Army moved on Sept 28th, via Kielce and Radom, on Ivangorod. The Russians, meanwhile strongly reinforced, assumed the offensive and after decisively defeating it near Kielce, drove the Central Army back to the line Czesochewo-Ockutz.

The operations of the Northern and Central Armies attained one of Hindenburg's objects, that of forcing the Russians in Western Galicia back to the San.

Early in November, the Russians again assumed the offensive in East Prussia and by the middle of that month the German line was "readjusted" to Stallupönen-Goldap-Lyck.

In the west, meantime, Antwerp had fallen on Oct 9th; the attempts of Germans and Allies to outflank each other had failed; the British Army had arrived in Flanders from the Aisne to fill the gap from Lille to the Yser; and the Allied battle line from Nieuport to the Vosges was complete.

The retreating Germans and Austrians had scarcely reached their own territory, before a new offensive was planned and initiated by Hindenburg for the purpose of removing the threat against Silesia by pressure against the Russians in Central Poland.

## EUROPEAN WAR—Continued

Twelve corps (500,000 men) were accordingly concentrated at Thorn and Wreschen under Mackensen, and a second army at Kalisch was to co-operate with him, forces in East Prussia and Galicia remaining on the defensive.

Mackensen advanced on a front of 50 miles, his left on the Vistula and his right on the Warta, the Thorn-Lowicz R. R. as line of communications, defeated the Russians severely at Kutno on Nov 15th, forced them back, and pierced their line on the 23d, with two corps that were later completely surrounded by the enemy, but managed to cut their way out, though losing all their guns and half their number. On Dec 6th, the Kalisch Army threatening their left, the Russians evacuated Lodz.

In Galicia, the Russians had meanwhile retraced their steps, seized the Dukla, Uzok and Lupkow passes through the Carpathians, and by the end of November were within fifteen miles of Cracow.

Before the second invasion of Poland, Silesia was seriously menaced by the Russians and high hopes were entertained by the Allies of a further Russian success. But the Russian defeat at Lodz materially altered the situation. Instead of being in a position to move forward in Central Poland, in December they were again staving off a German advance against Warsaw. If Mackensen's operations in November are considered a failure because he did not reach Warsaw, he can with justice claim that he frustrated the Russian hopes of invading Germany.

On the western front, meantime, the first battle of Ypres had been concluded and both sides had settled down to trench warfare, with its purely local attacks and counter-attacks and small gains and losses of ground.

The end of November saw the Russian front extend from Neu Sandec to the Vistula northeast of Cracow, the Dukla, Lupkow and Uzok passes in their hands and the plains of Hungary menaced. In the middle of December the Austrians launched an offensive from Cracow and against the passes from the south, forced the Russians to evacuate the passes and to retire to the Dunajec-Biala line.

The Russian gains in the Bukowina all had to be given up again when the enemy's great offensive began on Jan 23, 1915. Political considerations were mainly responsible for the Russian offensive in this region.

(To be continued.)

[The Forward Movement on the Russian Front. *The Sphere*, June 24, '16. 1000 words. Map and illus.]

(A resumé of the progress of the Russian advance through Volhynia and Galicia.)

[A Military Diary. By E. Krivtsov. *Voenny Sbornik*, June, '16. 3500 words.]

The author, having received permission to visit the Russian armies in the field, joined

the headquarters of General M., somewhere in Russia. Here he was at once received and attached as a guest to the general's staff, to whom he was already well known as a writer for the *Voenny Sbornik*. The general personally gave directions that the author should have full liberty to talk all matters over with the officers on duty at his headquarters, and himself suggested that in this way the author would soon learn many important facts.

The censorship maintained here was, so far as letters and correspondence to Russia was concerned, very liberal, as in all the larger cities these letters were again submitted to a local censor, thereby avoiding the necessity of extensive work in the field.

On the day after his arrival, the author was taken out to visit the trenches, the trip being made in an automobile as far as possible, and thereafter on foot. The Russian trenches conformed in general to the type prescribed for field fortifications, but the officers present reported that the German trenches in their front were much more elaborate. The German trenches, as a rule, were provided with head cover, and covered communication with the position of the reserves. In addition, many had been fitted up in communicating chambers. Complete wire communication was installed to the rear, and the Germans were stated to occupy seldom their front line trenches at night except when expecting an attack, trusting the safety of their lines to security detachments and their excellent lines of communication.

The Germans were at this time quite prodigal in the use of ammunition, especially in that for heavy field artillery, of which arm they seemed to have a large numerical preponderance.

The author did not on this occasion visit the infantry trenches of the Russians, but did visit the artillery positions and an artillery observation station, which was found to be several versts in rear of the most advanced trenches.

About this time the author was appointed to the position of headquarters' censor, and the work in connection with this office necessarily occupied much time. As a rule, the correspondence from the soldiers required the greatest attention, as the officers, being aware of the nature of the censorship, were careful to limit their writings to matters of no military importance, while the soldiers exhibited in this line considerable carelessness.

[The Russian Offensive. By Hilaire Belloc. *Land and Water*, June 15, '16. 6400 words. 2 sketches.]

The new Russian offensive is upon the same model as the other four great offensives of the series in which it forms a fifth. The other four are: The Austro-German offensive on the Dunajetz, undertaken on April 30, 1915; the combined Allied offensive in Champagne and Flanders, undertaken in Sept, 1915; the German offensive upon the Verdun sector, undertaken on Feb 21, 1916, and the Italian offensive in the Trentino, undertaken on May 14, 1916.

The lessons previously learned in the course of the war have been appreciated by all the belligerents and may be tabulated as follows:

1. A modern defensive, line properly prepared, can be held with a minimum of two men to the yard, including local reserves and the auxiliary services, but excluding men upon main communications. This minimum has proved sufficient to withstand such shocks as have been delivered when conditions of armament have been fairly equal between the two sides.

2. Such a line being established, and reposing upon flanks which cannot be turned, can, it is presumed (but hardly yet proved), be broken by a combination of two offensive factors:

(a) Prolonged and intense artillery preparation.

(b) The launching, immediately after the artillery preparation ceases, of great masses of infantry which occupy the region devastated by the artillery, capture the survivors of those who held the advance lines, and push forward as far as possible towards the second line of defense beyond.

Each of the great offensives has been based upon these two main principles combined.

The element of surprise is of great value, but this has been largely eliminated from modern warfare by the use of aircraft, while it is further evident that the accumulation of very large pieces and their munitionment is so slow and ponderous an affair that rapidity, a main element in surprise, is largely eliminated.

The first great offensive broke the Russian front on the Dunajetz and provoked an immediate retreat. The fifth great offensive, that of the Russians upon the Austrian defensive line in Volhynia and Galicia, is still in progress. The Russian effort has been to destroy the enemy's resistance in front of the right center of the line, extending from the Pinsk Marshes to the Rumanian frontier, the immediate object being to push westward from Olyka against Lutsk. This advance would enable the Russians to cut off and turn everything Austrian to the south. The line just south of the Pinsk Marshes to the Rumanian frontier is somewhat over 200 miles long. The total of the Austrian forces holding this line is a little over 700,000 men.

On June 12, the Russians had forced their way to west of Lutsk and were still rapidly advancing to the southwest, and ground had been gained in almost the entire front.

The official communiqués show that in this offensive the Russians have permanently destroyed by actual capture between a fifth and a sixth of the force opposed to them. The total losses of the enemy are certainly not less than 200,000 men. Seventy-seven field guns were captured in the first three days.

As an initial blow, the Russian success is much greater than the corresponding Austro-German success of last year, more prisoners and guns having been taken. As the Austrians retire, however, they will be amply munitioned as they fall back on their main depots, and such a line as that of the Bug, in front of

Lemberg, or any other line they may have prepared further west, would, if they could rally upon it, find them at least not short of missiles, which was the true cause of the Russian retirement last year.

On the other hand, the great Russian retirement gave the enemy no true decision on account of these two things in favor of Russia: an indefinite space on which to retire, and indefinitely large numbers from which ultimately to recruit. The enemy has no such advantage in the present state of the war. He is approaching the exhaustion of his reserves in numbers, and any retirement continued for, say, a month uninterruptedly, would be disastrous for him in the way of space.

[The West Russian Front. By M. B. From the *Voenny Sbornik*, Apr, '16. 3500 words.]

This is a digest of operations in Russia according to official sources. A summary of this digest follows:

Mar 5. In the vicinity of Riga and Jacobstadt the Russian artillery heavily bombarded the German trenches. Hostile reconnoitering detachments were repulsed.

Mar 6. The German artillery fired on Riga and vicinity. Fire was adjusted by the use of five aeroplanes.

Mar 7. Artillery engagements near Riga. Serious fighting near Illutsk. Two hostile attacks near Olika were repulsed. Along the Stripa the enemy were allowed to advance to within 50 paces of the Russian trenches and were then thrown back with great losses to them by the Russian fire.

Mar 8. The Germans attempted to cross the Dwina near Frederikstadt but failed. The Germans also bombarded with heavy artillery railroad stations between Frederikstadt and Dwinsk. Near Illutsk only minor actions occurred. Near Tarnopol in Galicia the enemy under cover of a heavy artillery fire attacked but was completely repulsed.

Mar 9. The fighting near Tarnopol continued, but with the assistance of the artillery the enemy attacks were everywhere thrown back with serious losses to them.

Mar 10. The Russian heavy artillery fired this day on a column of Germans in the Dwinsk region; other artillery actions also took place. Along the Stripa many reconnoitering engagements occurred. East of Czernowitz our artillery fired on a hostile battery which was observed while changing position, and which lost guns and caissons as a result.

Mar 11. Artillery actions along the Dwina; and successful reconnoitering engagements in Galicia.

Mar 12. Armored enemy automobiles attacked the Russian trenches near Riga, but were repulsed by artillery fire. General artillery engagements occurred along the Dwina, and minor engagements along the Stripa and in south Galicia.

Mar 13. Both in Galicia and in the neighborhood of Riga fighting of little importance took place.

**EUROPEAN WAR—Continued**

Mar 14. Considerable firing on this day along the Dwina.

Mar 15. Very heavy artillery fire together with hand-to-hand actions with grenades occurred near Dwinsk.

Mar 16. The Russian artillery dispersed hostile reconnoitering parties in the Dwinsk region.

Mar 17. The Germans again sent strong reconnoitering parties forward near Dwinsk, but these were all repulsed by artillery fire.

**EVENTS IN THE NORTHERN SECTOR**

Mar 18. Heavy artillery engagements occurred along the front. The Germans attempted to attack in only one place but were prevented from attaining any success by the Russian artillery.

Mar 19. Further artillery fighting together with infantry engagements south of Dwinsk in the lake regions, during which the enemy lost two machine guns.

Mar 20. The fighting in the lake country continued. At one place the Russians seized a portion of the front line of German trenches.

[Twelve Months of the War on the Eastern Front. *Jour. United Service Inst. of India*, July, '16. 18,000 words. Maps. (Continued.)]

**V.*****The Austro-German offensive in Galicia and East Prussia***

The month of January, 1915 was utilized by the Central Powers in marshaling their forces for a double offensive against the Russian flanks. It is computed that there were 49 or 50 Austro-German corps on the eastern front in February, of which 22 or 23 were in Galicia, 15 in East Prussia, and the remaining 12 in central Poland on the Bzura-Rawka-Nida line. The two fronts on which operations were contemplated were respectively 300 miles long in East Prussia and northern Poland, and 200 miles in Galicia.

The failure in December, 1914 of an Austrian attempt to relieve Przemyśl had been followed by a threat of invasion of Hungary by the Russians. To arrest this threat, to relieve Przemyśl, and generally to relieve Russian pressure upon this front, an Austrian force of about 600,000 men was concentrated at the end of January, 1915 in three principal groups, at Kassa, Munkacs, and Maramaros Sziget. It simplifies the description to regard the front as divided into three sectors, with objectives of the Austrians as follows:—(a) left sector, Dukla-Rostoki, objective Przemyśl; (b) center sector, Uzsok-Wyszkow, objectives, Stryj and Lemberg; (c) right sector, Jablonitz-Kirlibaba, objective Stryj-Husiatyn railroad and ultimately Tarnopol and the Russian railway communications. The advance began simultaneously in the three sectors on Jan 23.

In the left sector little progress was made by the Austrians, and after a stubborn resistance the Russians resumed the offensive

about Mar 20 after the fall of Przemyśl, and the left (Austrian) group fell back on the Lupkow pass. In the center sector the Russians were by Feb 6 driven back to the line Turka-Koziawa-Tuchla-Rozanka-Wyszkow. On this line there was heavy and uninterrupted fighting until about the middle of March, the Russian defence proving adequate. There followed a lull of a month, and the line was later abandoned by the Russians in the great general retreat in Galicia in May. Movement and maneuver characterized the operations in the right sector. The Austrian advance was not rapid at first. Their right wing reached the Sereth on Feb 13, and the Pruth on Feb 17, Kolomea and Czernowitz being occupied. On the left, considerable advance was made. Russian reinforcements arrived at Halicz and a counter offensive drove the Austrians back to the line Nadworna-Obertyn-Niezwiszka-Zalescyki-Czernowitz. Here on Mar 16 serious fighting died away. On Mar 22 Przemyśl fell, and thus all efforts to relieve it had failed. The efforts had been determined, but they were made on too wide a front and the Russians were thus able to meet them.

The four months siege of Przemyśl throws no light upon technical questions of attack and defense of fortified places as the Russians had no siege artillery. Single fortified places have a very limited containing power. This is greater in a chain of fortresses constituting a general defensive line as shown by Warsaw, Ossowiec, Kovno, and Grodno. The containing power of a fortress is, however, purchased at the cost of the garrison, as shown by Przemyśl. The opinion is hazarded that the "fortresses" of the present day will be replaced by an infantry line with movable artillery for which ready made emplacements will be provided, connected by "covered" lines of rail transportation.

***The German Offensive in East Prussia and North Poland***

These operations opened in February, 1915, with a vigorous demonstration by von Mackensen between Sochaczew and Skierniewice on the Bzura-Rawka front. There was very heavy fighting from Feb 2 to Feb 8. The world at large, possibly also the Russian General Staff, had its attention drawn away from East Prussia by this demonstration.

For four months after September, 1914, the German forces in East Prussia, composed of landwehr and landsturm troops, were on the defensive and had finally retired to a line Johannisburg-Lotzen-Darkehmen-Pilkallen-Tilsit. The German forces were weak, but only four corps composing the Russian Xth Army under General Baron Sievers opposed them. In February the German forces were strengthened to eight or nine corps, and formed into a northern army—Tilsit to Angerburg—under Gen. von Eichorn, and a southern army—Angerburg to Lake Spirding—under von Below. Gen von Hindenburg was in control.

The encircling movement began in the south

by the advance of von Below's right wing on Feb 7. There was stubborn fighting for a week in the Lyck-Rajgrad-Grajevo area. Feb 16, the 3rd Siberian Corps, having evaded encirclement, fell back toward the Bobr, and the 26th Russian Corps on its right fell back to Augustowo and thence to Grodno.

On Feb 8, von Eichorn's encircling sweep around the northern flank from the line Gumbinnen-Spullen-Schovel began. The 3rd Russian Corps beat a hasty retreat on Kovno, exposing the flank of the 20th Corps. The retreat of this Corps was cut off and it lost three-fourths of its numbers, the remnants emerging from the Augustowo forest at Sopokcine. Von Eichorn's army now advanced to the Niemen and assumed a defensive attitude. Minor operations occurred on his front in March, but the lines came to a standstill some twenty miles west of the Niemen and parallel to it, and so remained for more than four months. Only weak detachments faced each other on the frontier from Jurburg to Tilsit.

On the southern flank, von Below advanced slowly against opposition to the line of the Bobr River from Jedwabno to Stabin, fronting Ossowiec. He entrenched and bombarded Ossowiec with heavy artillery. This line remained practically stationary for six months, with little or no fighting.

Simultaneously with von Below's advance on Feb 7, a movement was begun in north Poland. These operations covered a front of 80 miles. Crossing the Skrwa River with the right flank resting on the Vistula, a demonstration was made in the direction of Plonsk. The main attack was made from the line Mlaw-Chorzele southeast against Prasnysz. There was heavy fighting around Prasnysz on Feb 22 and 23, and the Germans captured it on Feb. 25. It changed hands on Feb 26 and again partially that night, but on Feb 27 the Germans were driven back slowly toward the frontier. On March 8, they were reinforced and resumed the offensive, advancing to within three miles of Prasnysz by Mar 11. During the next week they were pushed back to the original line closely following the frontier.

The object of these movements is somewhat obscure. They were certain to overwhelm the Russian line in East Prussia. The Prasnysz movement may have been an attempt against Warsaw. Actually von Hindenburg cleared German territory and secured a knowledge of the difficulties of the Niemen and the Bobr, knowledge turned to good account five months later.

French local offensives at Perthes and near Pout-à-Mousson, and the British capture of Neuve Chapelle are the only operations worthy of note on the western front during Feb and Mar, 1915.

## VI.

### *The Russian Advance in the Carpathians*

The Austrian offensive previously described left them in possession of the Lupkow and

Uzok passes with their forces in front on the line Baligrod-Lutowiska in the valley of the San. The Russians were in possession of the Dukla Pass. The Russian operations were designed to capture the Lupkow and Uzok passes and consolidate the position at Dukla Pass, thus opening the way to the Hungarian plains. On Mar 23, the day after the fall of Przemyśl, the Russian advance began, the weight of their attack falling on the Austrian flanks. The Austrian line was driven steadily back, and by Apr 19 the Russians had captured Lupkow and Rostoki passes, but at Uzok Pass determined resistance was encountered, and it remained in Austrian possession. So ended a month of heavy fighting in which the Russians had captured 70,000 prisoners and two important passes. But only a week later the Russians in this theater were to be placed in a perilous position by the breaking of the Dunajec-Biala line in their rear. On the far end of the line, a German cavalry raid was started Apr 28 into Courland. By May 8, the columns were within 30 miles of Mitau. They were forced back, but retained possession of Libau. From this front the advance on Mitau and Riga was made in the middle of July.

*Retrospect.*—Russia mobilized more rapidly than had been anticipated and succeeded in invading East Prussia and inflicting heavy defeats upon the Austrians, into whose territory the Russians advanced. The Russians were promptly driven out of East Prussia, but held at the frontier. But the Russian forces were inadequate, and a German advance against Warsaw and Ivangorod in the middle of the third month of the war was stemmed with difficulty. Then it was realized that the Russian mobilization was incomplete. A month later, the German line surged forward in Poland and stayed. There was compensation in an advance on the San, but the initiative was passing from Russian hands.

After a lull, in Feb and March, 1915, a determined German effort in the direction of Warsaw was stayed. But to tardy mobilization was added the disadvantage of a salient frontier. This was not remedied by the Galician operations. An advance against either Austria or Germany left the flank of the advance open to the other.

Russia's contribution to the Allied cause in nine months of war may be realized by questioning what would have happened but for Russia's assistance. She had occupied the entire attention of Austria and attracted half the exertions of Germany.

The leaving of only five corps on the Eastern front possibly indicated a passive German defensive. The numbers were inadequate, and the moment von Hindenburg was placed in command and troops were available, the offensive was undertaken. The first invasion of Poland was called by the Germans a reconnaissance in force. But as soon as it was driven back, a second invasion was inaugurated which drove the defensive line far distant from the German eastern frontier and removed any

**EUROPEAN WAR—Continued**

threat of invasion of that portion of German territory.

Always the offensive principle was applied, first by Mackensen after Lodz, by the Austrians at the same time; then simultaneously in Galicia, in northern Poland, and in East Prussia. These offensives failed in whole or in part, but in five short weeks, thereafter, and these partly occupied by repelling a Russian counter-offensive in the western Carpathians, the Teutonic forces were ready for the great offensive which was launched in May, 1915, and then relentlessly pursued.

**VII.***The Russian Retreat in Galicia*

The Germans after their first assumption of the offensive early in the war, kept feeling out the Russian line. Every part had been tried in turn, and many parts more than once. Two advances were made against the Niemen, Bobr, and Narew fronts; two or three against the Bzura-Rawka line west of Warsaw; one against the front immediately south (later the Nida line); two against the front facing Cracow, both being combined with an advance over the western Carpathians; and finally the great advance from Hungary across the central and eastern Carpathians.

In the great Teutonic offensive now to come, the Russian armies in Galicia were the general objective but the front selected for the opening attack was the Dunajec-Biala line.

Removal of the menace of invasion of Hungary or Silesia, liberation of Galicia from Russian occupation, separation of the Russian forces in Poland and Galicia, and shortening the front have each been alleged as the Teutonic objective. Possibly von Falkenhayn had them all in view.

The Teutonic allies massed 500,000 men on a 50-mile front on the Dunajec-Biala line, of which the 20-mile front of von Mackensen, selected for the decisive assault, was the most heavily occupied. The Russians had only 14 corps (560,000 men) in Galicia, of whom there were about 200,000 on the Dunajec-Biala line. The Russians knew of the Teutonic concentration, but were unable to meet it without dangerously denuding other parts of the line. The Germans had thus a two-to-one superiority in numbers, and a greater superiority still in guns and in munitions.

The Austro-German armies were distributed as follows:—Vistula-Tuchow, IVth Austro-Hungarian Army, Archduke Joseph Ferdinand; Tuchow-Carpathians, XIth German Army, von Mackensen; Dukla sector, IIIrd Austro-Hungarian Army, von Bojna; Lupkow sector, IIId Austro-Hungarian Army, Boehm-Ermolli; Uzsok sector, Southern Army, von Linsingen; Dniester sector, Bukowina Army, von Pflanzer. Facing them were:—Vistula-Carpathians, IIIId Russian Army; Dukla and Lupkow sectors, VIIIth Russian Army; Uzsok and Dniester sectors, IXth Russian Army. These three Russian armies were under the chief command of General Ivanoff.

After a three day's general bombardment, the four-hour hurricane of fire which has become historic opened on the morning of May 2. In front of von Mackensen the Russian line was broken, and thus was inaugurated the Russian retreat which continued with varying fortunes and misfortunes. By the middle of May, the line of the San and the Dniester had been reached. Here for a month the Russian line held, and even local offensives were attempted.

Under cover of this resistance Przemysl was evacuated June 3, 1915. The principal Teutonic efforts during this month were those of Boehm-Ermolli and von Mackensen to close around Przemysl, and of von Linsingen to cross the Dniester and cut the communications of Lemberg.

A heavy accumulation of Teutonic forces in the sector to the north and south of Przemysl was the prelude to a further Russian retreat. The fighting opened on June 5, and on June 13 the Russian line was pierced from Sienawa to Czerniawa.

Not until June 22 was the Russian line driven back the 50 miles from Mosciska to Lemberg. Another ten days elapsed before the line of the Bug and Zlota Lipa Rivers was reached. The north bank of the Dniester was firmly held. The retreat to the above line was necessarily accompanied by readjustments along the northern edge of the area. On July 11, the Russian line was established from Josefow on the Vistula to Grabieszow on the Vistula, 25 miles south of Lublin and Cholm, and the Galician retreat came to an end, to be resumed a few days later.

Some readjustments took place in the province of Courland, where the Russian lines were withdrawn. Meanwhile, on the western front the second battle of Ypres (Apr 23-June 11) ended in a loss of ground by the British, but the French had made a gain north of Arras. On Apr 25 an Anglo-French army was landed in Gallipoli, and Italy entered the war on May 23.

General Ivanoff's conduct of the retreat showed great ability. Attacked in front and flank by superior forces, his front broken at the outset, yet he delayed the hostile advance for two and a half months, and brought his armies back intact. He assumed the offensive locally whenever possible. General Dimitrieff, commander of the IIIId Russian Army, deserves high praise. He has been blamed for the initial break in the front through not having provided second and third lines, but the odds against him were probably too great anyhow. His subsequent conduct of the retreat was admirable. His rate of retreat Tarnow to Jaroslav, eighty miles, May 2-14, was only 6 miles per day. The part of the junior commanders in these operations will not be written for a long time.

The Teutonic allies had a right to regard these operations as highly successful. The gain of territory was important, and the strategical situation was greatly improved. Warsaw had been narrowed to a dangerous



salient. But the Russian armies were still intact.

Several points will have been noted by the military student for later investigation. One is why the separation of the Russian armies north and south of the Vistula was not attempted. The front north of Tarnow could probably have been penetrated with the means used, and the flank of the Russian armies in Galicia would have been turned. It is possible that penetration and envelopment or separation of the inner flanks at the break was attempted. Von Mackensen's movements lend color to the supposition that this was the plan. If so, it failed, and no other opportunity was presented. The Carpathian front had been tested and found strong. The advance on the Dunajec-Biala line turned this front. If the attempt was made to cut off the Russians on the Carpathian front, it was foiled by Gen. Ivanoff's dispositions, and the Teutonic operations resolved themselves into a "drive," with the results of which the Teutonic allies had no reason to be greatly dissatisfied.

[Turkish Troops on the Eastern Front. *N. Y. Evening Post*, Sept 16, '16. Quoted.]

"The statement of the *Berliner Tageblatt* that 'trainloads' of troops, all newly equipped, have been reaching Germany from Turkey may have a little of the usual gas about it," says the *London Truth*, but it should not be disregarded. Since last October, Constantinople has been a sub-directorate of the German General Staff, and the resources of the Ottoman Empire have been at the disposal of Berlin. The only hindrance to the full organization of these resources against the Allies in Europe has been the British attack on the Tigris and the Russian attack in Armenia. For the last six months the Turks have had their hands pretty full in the East; but we may take for granted that the Germans have been busily raising, training, and equipping Turkish troops all the time; and also that when Germany begins to feel her back to the wall she will have no scruples about moving these troops on to her European frontiers, even if it means the loss of Armenia and the Euphrates valley."

[The Intervention of Rumania. By Hilaire Belloc. *Land and Water*, Aug 31, '16. 4500 words. 6 sketches.]

The action of Rumania in declaring war upon the Hapsburgs means that the final issue of the war is no longer in doubt even in Eastern Europe. Rumania has a complete system of conscription upon the model of the other Balkan States and of France. With a population of about seven and one-half millions, Rumania could ultimately develop a strength in the field of three-quarters of a million men. She has at this moment, enrolled, equipped and organized for war something over 600,000 men.

The Rumanian organization for war is about as follows: 10 first line divisions organized in 5 army corps of 2 divisions each;

(a division has from 20,000 to 21,000 men with from 12,000 to 13,000 bayonets); 10 reserve divisions, and the equivalent of 10 more divisions in men at the depots and in reserve for drafts. This would permit an arrangement somewhat as follows: 3 armies at the front of some 4 or 5 divisions each; a strategic reserve of 7 divisions, and some 10 more divisions of men kept back for drafts.

To each of the 5 military departments into which Rumania is militarily divided, one active army corps of two divisions is attached. On mobilization these are brought up to strength, and behind each is immediately formed a twin reserve corps of 2 divisions. Some 20 divisions, therefore, organized in 10 corps, 5 active and 5 reserve, form the army that will take the field. There remain about the equivalent of 10 more divisions of trained men to be used as drafts, in other words there is a provision for replacing wastage of one man for every two engaged. The trained and professional leaders which form the frame-work or *cadre* of an army are in the case of Rumania on hand, the quality of her army is therefore high. The Central Empires are long past the stage in which abnormal recruitment has become necessary. In Austria-Hungary men who had originally failed to pass the doctor were called as early as May and June, 1915. In Germany they were called by September and October of the same year. Some months ago Austria-Hungary was compelled to call out the class 1918 and the German Empire began last June to follow suit, the first German recruits of 1918 being summoned in Saxony during that month. The fresh Rumanian forces not only enter with mature classes only, but with a very large reserve of drafts behind the field armies, which reserve is also composed of mature classes alone and of efficient. The addition of forces obtained by the intervention of Rumania looks small in proportion to the full Allied power, but it is very considerable for the field in which it appears. The field in question may roughly be called the southeastern front. It is the field which, until very recently, stretched from the Pinsk Marshes to the southern border of Bukovina and which now stretches on nearly another 350 miles, to the Danube. The Teutons had between 44 and 47 divisions on that front last June. The tremendous Russian victories of June and July obliterated a vast proportion of this defending force. More than one-third of it was actually taken prisoner. From one-half to two-thirds had ceased to exist as effectives within the first eight weeks of the Russian offensive. The gaps were ultimately filled by exhausting the remaining German strategic reserve and all that Austria-Hungary could summon of reserve manpower. The depots were emptied and the line, longer than before, was reformed, but not in a stable fashion, for it is in movement now and locally in retreat. We are all, by this time, familiar with the fundamental strategic issue of the war. It has been one great siege and its duration, like its issue, has depended upon the power of the Central

**EUROPEAN WAR—Continued**

Empires to hold the lines within which they are contained by the Allies. These lines cannot be shortened by retirement save upon one sector: the western sector. Elsewhere every retirement of the Teutons lengthens the line. In the east they cannot fall back save at the price of invasion and even so their line necessarily lengthens as it retires. The same is true of both the Italian and the Balkan fronts. The lines the Teutons now hold are extended almost beyond their powers. It is their extension which has led to the present certitude of defeat. The intervention of Rumania adds to these gravely extended lines something like another 350 miles.

(Here follows a very interesting discussion of the plan of campaign open to Rumania which to be comprehended clearly necessitates the use of maps and of the sketches shown. At the request of the Press Bureau, certain omissions had to be made in Mr. Belloc's article, so that there is a break in the latter part of his argument.)

[The Rumanian Operations. By Hilaire Belloc. *Land and Water*, Sept 7, '16. 2000 words. 2 sketches.]

Three theaters are involved in the Rumanian entry into the war. A fourth may come into existence at any moment. These theaters are:

(1) Bukovina, in Eastern Galicia, the country just to the north of it, and in Northern Rumania that is just to the south of it. This field has for the thesis of its higher command either the piercing of the obstacle presented by the Carpathians or so strong a feint upon it as to compel a large German concentration there and a corresponding weakness elsewhere.

(2) The second field has for its thesis the Rumanian occupation of Transylvania. This is undoubtedly the objective of the higher command. The plan is to contain the Austrians on the center and north of the frontier and to advance from the south, and thus to compel the Austrians to evacuate the great salient of Eastern Transylvania and to fall back westward. The Carpathian region is a great obstacle because of its few communications, its dense forests and its earlier winters. The Transylvania campaign must therefore be regarded as something separate and distinct from the Russian action on the north.

(3) The third field directly connected with these eastern operations is that in which the Bulgarian army is operating against the expeditionary forces of the Allies which are based upon Salonika and are under the command of General Sarrail.

A fourth field of operation may come into existence with the advance southward of the Russian force against the Bulgarian frontier, the beginning of which advance has been officially announced.

In this article the second and third fields are treated.

**THE INVASION OF TRANSYLVANIA**

This has taken the form of a seizure by the advanced guards of all the passes, road and railway, from the Northern Gyimes Pass down to the Danube. The expression "advanced guards" is used because Rumania has not yet put her full armies in the field. The passes are nine in number, counting as one that at the Danube itself between the river and the end of the Carpathian chain. Possession of this pass gives the Rumanians control of the Iron Gates and therefore closes all of the lower river to the enemy. From the Danube northward the next pass is Vulcan Pass. Here the Rumanians hold Petro Zseny. Next comes the Red Tower Gorge, a road and railway pass. Beyond this the Rumanians have occupied Hermanstadt. The next two passes, the second a road and railway north of Predeal, the first a convenient flanking road near by, have been seized, and Kronstadt, which is their junction, has been occupied. The other four passes are in the same situation; the Rumanians hold them all. The Teutons have not held the frontier line strongly and this suggests a withdrawal, because of insufficiency of men, to a shorter line more easily held in rear. This might be roughly the line Bargo Pass—Maros River—Orsova, which it will take at least 10 divisions to hold. How that force can be assembled without dangerously weakening some vital sector in the 2500 miles of front is the Teuton's affair.

**THE BULGARIAN OPERATIONS**

The Bulgarian offensive in the "Salonika" campaign has come to a halt. The counter offensive of the Allies has not yet begun. The Bulgarians have here about 10 divisions on the line, nearly 120 miles in length, Banitsa Lake, Doiran, Demirhissar Bridge, Struma River. The Bulgarian division is a larger unit than the French, British, or Serbian division. There are probably more than a quarter of a million men facing the Allies from the Struma Valley to the approaches of Monastir.

Exclusive of the forces on the Salonika front there are, so far as is known, 5 Bulgarian divisions, with a mixture of German and Austrian units, towards the north watch. The attack was in the Dobrudja.

[The Danube and Its Effect on Dobrudja Strategy. By Edward Foord. *Sphere*, Sept. 23, '16. 600 words. Map.]

When Rumania invaded Transylvania the Central Powers at once struck in punishment. The attack was in the Dobrudja.

The Danube forms a large part of the southern boundary of Rumania and is a formidable obstacle. It is generally over a mile wide with marshy banks down to Silistria. Here it spreads into a maze of marshes and swampy islands ten miles wide and so continues to the sea. At Chernavoda, where the Bucharest-Constanza railroad crosses the Danube, is the only bridge over the lower Danube. The central bridge over the main channel is over 800 yards long, and 100 feet

high. There is a fortified bridgehead at the eastern end.

The Dobrudja is a detached fraction of Rumania, barren and inhospitable. An army to operate here must be provided with an enormous number of pontoons.

The Rumanians blundered severely in the early operations and paid the penalty by losing a division at Turtukai. Another division saved itself by crossing the Danube in boats at Silistria. Then a line was taken up about 10 miles south of the Chernavoda-Constanza railway, where trenches had been previously prepared. Here they remain. A retreat would necessitate the destruction of the Chernavoda bridge.

### SOUTHERN THEATER

[The Trentino Offensive. By Hilaire Belloc. *Land and Water*, June 1, '16. 1900 words. 2 sketches.]

The ground over which the new Austrian offensive is developing is an oblong, about 30 miles by 45. This oblong is roughly bisected by the old artificial frontier between the Austrian Trentino and the modern Italian state. The offensive is important in that it menaces the Italian lines of communication leading from their supply bases to the Isonzo front. These lines are two nearly parallel railways which pass just south of the Trentino projection. When the frontier between Italy and Austria was drawn, the Trentino projection was designed specially to weaken the Italian state and to strengthen the Austrian. The modern importance of railways has greatly increased its advantage.

The two avenues leading from Trent to the Venetian plain, the valley of the Adige and the valley of the Brenta, carry the two main roads and the only railway in the district. It is impossible for the enemy to operate in force until he gains one or both of these avenues. Upon this account the main Italian resistance has been massed in the two valleys, and in these, so far, the enemy has not made good.

[Pressure Upon the Trentino Front. By Hilaire Belloc. *Land and Water*, June 15, '16. 2000 words. 3 sketches.]

The Russian offensive will not immediately relieve the pressure upon the Trentino front, because it would be impossible for the Austrians to dispatch adequate reinforcements from the Trentino to the Galicia front in less time than several weeks. A single division occupies 80 trains at least. Excluding the original units holding this front, the special concentration here of the Austrians is not less than ten divisions. Great delay is also involved in moving, even by rail, the heavy guns and their munitionment.

Success in this quarter would give the enemy a decision, as it is the only place in Europe where the Allied communications are in peril from a flank attack. The Austrians, for their advance, must ultimately control the Brenta and Adige valleys. Pending their possession of these two avenues, there is a second-best which would suffice for temporary needs if the

advance could be rapid. This is the road from Rovereto to Schio over the Fugazze Pass. The Austrians, after a month of fighting, have failed to grasp even this second-best line of communications. They have got their line into a big salient which occupies the Asiago plateau, and from that place, with their heavy guns placed just behind the northern crest of the plateau, they are making alternate efforts to the right and to the left. The Italians are now making successful local counter-offensives which seem so far to contain the enemy.

[A Study of the Italian Front. By Hilaire Belloc. *Land and Water*, Aug 24, '16. 3600 words. 3 sketches.]

The plan to break out against the Italians through the Trentino had a multiple character. First there was the point that here alone one of the main communications of the sector of the Allies ran right in front of the Austrian striking power. Second there was the fact that the Trentino alone offered something of a gap in that enormous mountain wall which everywhere else obstructed effort on either side. Also a success here would have had the political effect of putting the Austrians within a few days of the Italian Plain in occupation of the rich cities of that plain, notably of Verona and Vicenza. Lastly there was the fact that an attack here came at a maximum distance from Italian headquarters, and from the main Italian front upon the Isonzo. Climatic conditions prevented any considerable action upon this front until May. The great drawback to the use of the Trentino front was the fact that it depended for provisionment, for evacuation of wounded, for its supply of shell and everything, upon one line of railway, the line leading from Trent to the junction of Franzenfeste. Beyond this point there were two lines, one going through the Pustertahl eastward and the other up northward to Innsbruck and to the Bavarian and German centers, whence the Austrians drew a large part of their supply, although Italy was not, technically, at war with Germany. A second drawback was the waterless condition of the Asiago Plateau. A third drawback was the absence of good communications for an advance. There were two main divergent avenues; the great road and railway by the Brenta Valley and the great road and railway by the Adige Valley, both convergent upon Trent. Between the two, over a distance of 40 miles, there was only one good road, that from Rovereto to Schio, at which latter point a single line led down to the plain.

Poverty of communications made it necessary for the Austrians to depend upon a rapid success; and also made it necessary for them to begin preparations a long time before they actually attacked. They spent five months in accumulating food and material and in massing a prodigious quantity of guns. There were over 2000 guns, one-half of which were heavy pieces, from 4-inch upwards, while more than 5 per cent. of the whole were the

**EUROPEAN WAR—Continued**

very heavy pieces that move only by rail. There were 18 infantry divisions at least. This means that of the whole available forces of the Austrians at the moment nearly one-half were present against the Italians before the middle of May, leaving only the larger moiety to hold the front in Volhynia and Galicia, a thousand miles away, against the Russians. Of the nearly one-half of the available Austrians massed against Italy more than nine-sixteenths were in front of Trent. The whole of the 18 divisions had not of course deploying room. The idea was to attack with about one-third holding the remainder back as a reserve. The first shots of the Austrian bombardment were fired on May 14th. The deluge of shells broke the Italian advanced lines and compelled them to withdraw in the center to the proximity of the frontier ridge. The Italians held their own on the two wings because it was immediately conceived by their higher command that the critical points where resistance was all important were the valleys of the Brenta and the Adige. Upon the first the Italians yielded but a few hundred yards. Upon the second they yielded by some three miles. The two great avenues were thus securely held. They were moreover blocked by the Rovereto-Schio road, thanks to the tenacity with which Pasubio Mountain, dominating the entire region, was held.

The Austrian offensive after its first burst comprised four main efforts:

(1) The effort to turn the Pasubio by forcing the Bosina ridge and so cutting the Rovereto road.

(2) The effort to seize the pass between the Rovereto road and the Adige Valley road and railway behind the mountain summit called the Coru Zugna.

(3) The attempt to force the center across the plateau of Asiago and down immediately on to the plains.

(4) The effort to turn the Italian positions on the Brenta by getting round on to the Lower Brenta towards Valstagna.

All four efforts failed. The tide turned in the week between June 4th and June 11th, after the offensive had lasted three weeks. The rapidity with which the Italian higher command massed its men defeated the Austrians.

[The Russian Front. Turkish Strategy. The Salonika Front. By Hilaire Belloc. *Land and Water*, Aug 24, '16. 1500 words. 3 sketches.]

**The Russian Front**

There has been but little change here. Bohmer has retired to the line of the Zlota Lipa, the middle and upper reaches of which he is trying to hold, but the lower part of which he has abandoned. The Teutons have effected a concentration to defend the approaches of Halicz upon Bohmer's southern flank and the vital railway upon his northern. Their defense here still continues successful. It is probable that the mass of their forces

is withdrawing in order to consolidate upon some better line in rear, perhaps the line of the Gnala Lipa. The Russian forces in the Carpathians are not yet over the Hungarian border. They occupy the village of Jablonitz which is at the foot of the pass on the Galician side. There has been no appreciable advance during the last week upon the Stokhod line. The critical point still remains the front before Halicz and the railway approach to Jezupol, where the Gnala Lipa falls into the Dnieper.

**Turkish Strategy**

The Turkish forces are now reduced to 42 divisions, about 400,000 men, as not all are at full strength. After the loss of first Erzerum and then Trebizond it was determined to abandon central and northern Armenia, and the bulk of Turkish effort was turned to saving Mesopotamia.

The Turks have succeeded in pushing back into Persia the small Russian force which was moving against Baghdad and have also checked the Russian advance against Diarbekr. Three independent Turkish armies are now echeloned towards the East as follows: The Northern Army confronts Erzingan, the Central Army covers Mush and Bitlis, the Southern Army covers Baghdad. For the moment the Turkish hold upon Mesopotamia and its communications is safe. The political conquest of Northern and Central Armenia by the Russians appears equally definitive. The Turks have saved one district at the expense of the other.

**The Salonika Front**

The Salonika offensive has begun; the counter-offensive of the Bulgarians has immediately followed. The presence of Russian and Italian troops shows the political importance of the movement. The Bulgarians have thrown their main force upon the two wings, 100 miles apart, of the Allies. To the east they have advanced to and crossed the Struma. To the west the Serbians have fallen back before them to Ostrovo Lake.

The main plan upon the Allied side has not yet been made known.

[The Strategy of the Balkans. By Hilaire Belloc. *Land and Water*, Sept 28, '16. 3800 words. 3 sketches.]

Strategical action in the Dobrudja for the present is confined to the Dobrudja itself, that is, to the remaining area between the Danube and the Black Sea. The shape of this area may be compared roughly to a broad-waisted hour-glass or dumb-bell. The southern base of it corresponds with the new frontier drawn up in 1913 between Rumania and Bulgaria. The northern extremity is the delta of the Danube and the narrowest part corresponds exactly to the depression used by the railway from the Cernavoda Bridge to the port of Constanza. The dimensions of the area are an average of 125 miles in length; a southern base of 100 and a northern boundary of 70 miles in breadth (nearly a third of the latter being impassable marshy country,

half land, half sea, upon the mouths of the Danube), while at the narrowest it is only 30 miles across.

This shape has the following strategical consequences: Any one desiring (as did Mackensen) to seize the railway and the bridge thus standing at the narrowest point, finds himself advancing up a territory which gradually contracts as he goes forward. He is going, as it were, into a funnel. But it is a funnel of such great size that there is no danger even of a very large force getting congested. On the contrary, the difficulty is to maintain oneself in strength over the broader part. The further one goes north, the more certain one is of holding one's line against a counter-attack, of maintaining inter-communication and of securing oneself against being turned upon either flank. Conversely a force defending the vital railway and bridge has a shorter and shorter line to hold as it approaches that railway. The line taken up (the prepared line upon which the Allies were ready to fall back as a principal line of resistance, but which the Teutons have failed to reach) was about 12 miles in front of the railway and not over 40 miles long. With every advance south of this, a force standing merely on the defensive would be weakened, for there would necessarily be an extension of the line. The four types of communication for either party in this district are: roads, railways, the river and the sea. The calcareous nature of the soil permits free use of wagon roads, but makes difficult the question of water supply for a large force. The railway communication is of a singularly symmetrical type for both sides. Both have an admirable lateral communication behind the lines: the Allies the railway from the Cernavoda Bridge to Constanza, the Teutons the line from Rustchuk to Varna. Each party can also use as far as its advance goes the single line, recently constructed and perpendicular to both of these, from Medjidie through Cobadinul to Dobritch and so to a junction with the Rustchuk-Varna line at Belevo near Varna. The river communication is probably debarred from both combatants. The sea cannot be depended upon by the Allies for their principal line of supply. As for the Teutons, all their munitionment is by the international railway which unites Belgrade and Sofia with Constanza.

In his advance against the Rumanian, Russian and Serbian forces which had the task of defending the railway and bridge, Mackensen, influenced probably by the question of water supply, elected to move the mass of his army by road near the Danube. His force, of from six to eight divisions with a considerable number of heavy guns, struck the advance body of the Rumanians upon the line Karaorman-Parachioi. The Rumanian forces retired. This action was the source of the telegram describing it as a "decisive victory," which the German Emperor sent out last week. The real struggle came nearly a week later on Sept 17, 18 and 19, and was engaged, not upon the Rasova-Tuzla defensive line,

which Mackensen failed to reach, but about six miles south of that line. Mackensen's main blow was delivered in the broken and wooded country lying in front of the line joining Rasova and Cobadinul. His line was thinly extended towards the east to guard against being turned by his right. This extension had passed and occupied the port of Mangalia before the main battle occurred. Mackensen's blow failed in its effect. The Russo-Rumanian counter-attack was delivered against the weaker eastern part of his line. Upon the delivery of this stroke, which was in the nature of a turning movement trying to get around his right, the usual contradictory reports appeared, each side giving its own version. A comparison of the two versions clearly shows that the advantage lay with the Russian and Rumanian forces. What would seem to be the general result is this: Mackensen, having struck with the bulk of his forces upon his left against the Russo-Rumanian right, and using a superior weight of heavy guns, attempted to break through. He did not break through, but was held and was counter-attacked upon his right by the Russo-Rumanian left. He then fell back about one day's march to the south, where the action is perhaps still in progress.

#### SOUTHEASTERN THEATER

March

[War Notes. By Capt. H. M. Johnstone. *United Service Magazine*, Feb, '16. 5000 words.]

Without the slightest leaking out of information to the public on this occasion, the great evacuation of Gallipoli has been completed. But, though the secret was well kept, it was practically certain that withdrawal would come before long. From the beginning of the military part of this episode, when at the end of April the English found the enemy had made good use of the warning he had had,—from the moment trench warfare began, doubts as to success of the English forces rose. If they had been faced by a German army instead of a casual body of Turks, the situation would have been much worse. They escaped just in time, for not only is the worst of the weather about to set in, but the Turkish gun and munition supply was beginning to be augmented.

\* \* \* \* \*

A reasonable estimate as to the number of Teutonic Allies in the Balkans at this time is as follows: Austrians and Germans, 300,000, of whom 100,000 might be still attending to the Serbians, 30,000 looking after the Montenegrins, 50,000 along the Danube towards Rustchuk, and 20,000 garrisoning points in Serbia. That would leave 100,000 free to deal with the English at Saloniki. However, many divisions have had to go to Volhynia and Galicia, and von Mackensen himself has gone there. Bulgaria probably had 300,000 regulars and 50,000 comitadjis in the field, but many of the regular regiments were exhausted through severe suffering. Most of the comitadjis and at least 50,000 regulars would be

## EUROPEAN WAR—Continued

on the Albanian border in the Dibra region, and some 30,000 or 40,000 more about Ochrida and Resna to the south. A considerable body, which might be guessed at 30,000 would be at Dedegatch and on the south coast. Garrisons at Sofia, Philippopolis, Varna, Burgas, Kustendil, etc., would account for 40,000 or more, while the Danube and the Dobrudja frontier would certainly have some troops. On these figures, there would remain considerably less than 150,000 in Southern Macedonia.

There are reports that the Bulgars immediately to the north of the English have drawn back a space and are more intent on defensive entrenching than on attack; the Turkish divisions signalled as advancing from Kustendil down the Struma valley have not materialized on the front; the 60,000 Austro-Germans about Monastir have dwindled to a dozen battalions. It does not look like a very promising offensive for the enemy, but the English position is so much like a thorn in his side that attempts at extraction may be expected if the necessary force can be assembled.

There are three theaters of actual or imminent fighting, viz., in Albania, South Macedonia, and Mesopotamia—without counting the Caucasus, Galicia, and the irregular work in Persia. Of prospective and possible fighting, there are the scenes towards Egypt and at Aden and in the direction of Rumania. Of these theaters, Egypt is the one likely to produce some active work on a considerable scale. If the enemy does intend to make an attack, there are still about three months of the best season for the venture. In some reports he is credited with great elaboration of preparation, including not only two lines of railway, but actually a water-pipe line. If he waits for these, as well as to train and equip the raw levies he proposes to add to Djemal's Corps, he will be into the summer before he gets under way. Germany has now got Rumania hemmed in with hostile troops from the Bukowina in the north along the Carpathians of Transylvania to the Danube, thence along the Danube eastwards to Rustchuk, and along the Dobrudja border to the Black Sea. It is doubtless a thin disposition, but Rumania is not likely to attack, and therefore not unnaturally hangs back from provoking an incursion, having seen what happened to Serbia.

"The first stage of the Balkan campaign saw the gallant but hopeless fight of Serbia against an overwhelming horde of Austrians, Germans and Bulgars, and the fine attempt of General Sarrail, with numbers all too few, to join up with the southern Serbian army. When the French force had advanced to the lower Tchernia, and was covering the Saloniki railway from Krivolak to near Rabrovo, with the British force on its right flank at Kosturum and Lake Doiran, the Serbs had

just been expelled from Veles and were struggling to cover Prilep by a disposition on the Babuna Range. But the Bulgars felt the importance of keeping us apart, and reinforced their southern army in order to drive a strong wedge between us and the Serbs. General Sarrail might have succeeded temporarily if he had had 30,000 more troops. Establishing himself firmly in the angle of the Tchernia and the Vardar, with Kavadar as center of this left wing, he made a fine effort to push across the front of the Babuna Range to Izvor. He seized the Rajec bridge on the road to Prilep, and, leaving himself with a very scanty reserve, attacked the villages about the southern slopes of the commanding hill called Mount Arkangel. Successful at first, the French soon found themselves outnumbered, and had some reason to fear for their line of retreat to the bridge. This was in itself an embarrassment for the lower Tchernia, at no time fordable, was in the autumn a raging torrent, difficult to bridge, and presently word came in that the Serbs had lost the Babuna, and could not even maintain themselves at the level of Prilep. So General Sarrail withdrew behind the Tchernia, the attempt to join the Serbs having failed. Had he now had enough troops to extend a strong left flank as far as the source of the Rajec, that is, to the northern end of the roadless range of heights that runs southwards between the upper and middle Tchernia, he might have held on in this forward position. But, realizing that he could not cover this flank, he gave orders to pack up and retire down the Vardar. Bulgars soon appeared at Mount Radobil, aiming to cross the Tchernia towards Davidowo, and hastened the evacuation of this angle, which, however, was effected without loss of gear. This move was the signal for fierce attacks in the Demir Kapu region and against our dispositions near Lake Doiran. The French retired in perfect order, inflicting much damage, and we held on until they were well past Davidowo. Then there was a general retirement towards Saloniki across the Greek frontier, very slightly molested, for the enemy was struggling with destroyed railway and damaged roads."

[The Anglo-Russian Campaign in Turkey. By J. B. MacDonald. *American Review of Reviews*, Apr., '16. 4000 words. Map and illustrations.]

Assuming here the well-known interests of the British Empire in Persia, the military geography of Turkey at once fixes the attention. In ancient times, the only practicable road from Europe to Asia was by the Balkan valleys across the Bosphorus or Dardanelles, hence the importance of Constantinople. From Scutari, the overland route stretched across Asia Minor to Aleppo in Syria, where it forked, one branch going down the Mesopotamian Valley to India, the other by the eastern shore of the Mediterranean to Egypt. To the north, the Urals, the Caspian, the Caucasus and the Black Sea cut off communication between the two continents. Further south, the watershed of the two rivers, with the

Caucasus, barred economical advance. But a practicable road was furnished at the lower elevation of the Taurus and Amanus Mountains, two parallel ridges striking the sea at the Gulf of Alexandretta. Through this Taurus passage must go any invasion of Asia from Europe, and conversely. Now in Asia Minor, the only railway of importance is the main line from Scutari to the Taurus tunnel, in course of completion near Adana. Beyond this tunnel is another in building through the Amanus Mountains. From Aleppo, the Syrian railway runs through Damascus to Medina and Mecca. Branches reach the Levantine ports of Tripoli, Beirut, and Haifa. Another railway was begun shortly before the war from Aleppo to Bagdad, and construction started at both ends. In other words, the three main railways of Asiatic Turkey meet at Aleppo.

The campaign in Mesopotamia had its origin in the despatch by the Indian government of a force to protect the oil fields, plant, etc., of the Anglo-Persian Oil Company at and in the neighborhood of the head of the Persian Gulf. This small beginning led to the campaign up the rivers, and the definitive check of Townshend's force at Kut-el-Amara. But the relief expedition sent out, coupled with the Russian capture of Erzerum and subsequent advance west and south, must be regarded as the preliminary steps of a campaign the objective of which is Aleppo, and the results of which would be first the end of German intrigue and of Turkish weakness in the East, and next the fall of the Ottoman Empire, with Britain and Russia, at the end of the war stronger than ever in the East.

[The Simmering Balkans. By T. Lothrop Stoddard. *The American Review of Reviews*, July, '16. 4000 words.]

Greece to-day presents a spectacle of economic distress, political confusion, and partisan recrimination. The peril from without, by which she is threatened on all sides, is heightened by dissension within.

The Greek people are about evenly divided on the issue of neutrality or war. The mainland, roughly speaking, is for neutrality, while the port towns and islands are for an Entente alliance and war. This is the logical division, since the agricultural population are heartily sick of strife and long above all to till their neglected farms, while the shipping interests realize that they are in the power of the Entente navies.

At the outbreak of the war, the Entente nations counted almost as a matter of course on Greek assistance, and Greek neutrality has aroused them to a pitch of angry disappointment. What perhaps has saved Greece from ruthless coercion has been the strong traditional Philhellenic sentiment in France and England. But this feeling is rapidly changing, and it is safe to say that the French and English governments can do to-day what they would have hesitated to do a year ago.

A revolution against the king would be welcomed by the Allies, but this appears hardly likely. The army is evidently loyal to Con-

stantine, whose brilliant campaigns against the Turks and Bulgars awakened genuine love for him among the people and made him the army's idol.

The prospect, therefore, is that Greece will maintain her neutrality unless the Allies compel her to take sides. The Greeks themselves have no idea what the decision would be. One thing is certain, the army has steadily become more and more anti-Ally.

Bulgaria, on the contrary, is thrilled with the intoxication of victory. Her fixed idea has been of Bulgarian race-unity. By the Bucharest Congresses of 1913, she was forced to sit idly by and watch the hated Serb root Bulgarianism out of Macedonia by ruthless persecutions. Now all is changed, but the changes are by no means secure.

The Entente powers have sworn to avenge their Serbian ally's downfall, but the Bulgars have pondered the matter well and hold the risk of national death preferable to acquiescence in permanent racial mutilation. This is the best answer to the rumor that Ferdinand would quit the Teuton camp and make peace with the Entente if all does not go well with the Central Powers. Ferdinand himself might be willing to do this in order to save his crown, but he has not the last word in these matters. The Bulgarian people control, and they will not give up Macedonia willingly; and the alignment with the Central Powers can be regarded as a fixed quantity.

Rumania still maintains neutrality, although the pressure is great from both sides. She presents a solid inland block, impervious to the Entente naval strength; and with a powerful army is successfully resisting Teuton pressure. Her strategic position is so strong that neither side can afford to drive her into the opposite camp. She is not only self-supporting, but a large exporter of cereals. Political Rumania contains only eight millions of Rumanians, whereas the race numbers some fourteen millions. The "unredeemed" portion is divided between Russia and Hungary. If Rumania should enter the war and be so unlucky as to choose the losing side, she might be wiped out altogether.

The thorny thicket of Rumania's internal politics complicates the problem greatly, but the present premier, John Bratiano, has bided his time with exemplary patience and has absolutely refused to be "drawn." The ruling classes of Bucharest control the country, and Bratiano seems firm in his position with them, with the likelihood that neutrality will be preserved.

[Military Events in Armenia, Persia and Mesopotamia. By M. B. *Voenny Sbornik*, Mar, '16. 2600 words.]

After Feb 1, the Russian Caucasus army moved forward and attacked the enemy's positions in the direction of Erzerum, taking many prisoners, guns and trophies of war. The advance was made under many adverse circumstances, due to the time of year and the very inclement weather. Bad roads, steep grades, deep snow and heavy frosts were all met with.

**EUROPEAN WAR—Continued**

Feb 16 the army under the command of General Udinochev, after a five days' action seized the fortress of Erzerum, and pushed on to the westwards after the Turks who retreated towards Ashkala. At the same time the Russian troops to the south defeated the Turks and occupied the towns of Moosh, Aklad and Bitlis, reaching the latter place on Mar 3.

In the Black Sea region the Russians forced the enemy back across the Arkaf river and on Feb 23 took Ispir.

The Russian advance caused a panic among the Turks, who looked upon Erzerum as the key to Armenia. And in addition they feared for their communications leading to that part of their forces which were opposing the English in Mesopotamia, as a further Russian advance to the south would enable a junction to be made between the Russians and the English. All the Turkish and German plans for an invasion of Egypt or India were now completely abandoned, and all efforts were concentrated to meet the new danger in Asia Minor.

The fortress of Erzerum is of considerable strategical importance in Armenia, as it is an important road center. The town is situated some 65 miles from the Caucasian frontier and is encircled by hills on all sides except on the west. On the southeast front were 9 forts about  $7\frac{1}{2}$  miles from the town which formed the first line of defense. The second line of defense was composed of four forts about three miles east of Erzerum, and two other forts south of the town. In addition about  $1\frac{1}{4}$  miles out of town were still three other forts, so that the city was certainly well fortified.

Feb 3, the Russians had advanced along the entire front with the weather below zero Fahrenheit. Feb 5 the Turks were defeated with considerable loss to them. This advance was continuous from the Black Sea to Lake Van for all troops in this sector. Feb 11 the first considerable captures were made, 7 guns, 10 officers, 600 men and 1000 cattle being taken. Heavy explosions were observed in one of the forts after this action. Feb 12, after explosions had occurred in one fort it was successfully attacked, many prisoners, 6 guns and much booty being taken. Feb 13 after artillery preparation another fort was stormed and taken and 20 guns and many prisoners captured. By Feb 15 seven more forts with 70 more guns were taken. Feb 16 after a continuous action over five days, Erzerum was in flames and was finally stormed and captured by the Russian army.

With the capture of Erzerum there fell into the hands of the Russians, besides the guns and prisoners previously mentioned, 29 more guns, 1452 prisoners, a large part of a siege train, many small arms, a pontoon train, about 20 automobiles and a wireless station. The Turks retired in considerable disorder in several different directions, and the pursuit was promptly taken up by the Russians.

Feb 17, the 34th Turkish division was lo-

cated retiring towards the southwest, and one Turkish regiment was found on the railroad leading to the west. On this same day the Russians occupied Moosh.

Feb 18, The retiring Turks were attacked and defeated and more than 2500 prisoners and 6 guns captured.

Feb 19, a few hundred more prisoners were captured. A Cossack squadron gained the flank of a Turkish column, composed of artillery and infantry, quickly attacked them and captured two batteries and many wagons.

On the same day the Russian cavalry encountered a regular Turkish cavalry regiment, supported by infantry, and defeated them, taking numerous prisoners.

The total booty resulting from the Erzerum campaign amounted to 235 officers and 12,753 men captured, together with 323 guns and 9 flags.

The Turks were so demoralized by their defeat that in some of the three divisions of the Armenian army corps only from three to five thousand bayonets, supported by a few guns, were present for duty.

Feb 29, the Turks were once more defeated, with a loss to them of 4 more guns, in the neighborhood of Bitlis.

Mar 1, the Turks took the offensive near Bitlis during severe cold and deep snows, but they were repulsed. Two nights later, the Russians took Bitlis by storm, capturing 6 guns and many prisoners. The fighting was of a hand-to-hand nature with the bayonet, and was very stubbornly contested, the artillery positions being assaulted after the capture of the infantry positions, 20 guns being taken. Much other booty was also taken.

Mar 4, the Turks were also defeated in the Black Sea region, with a loss to them of about 300 prisoners.

(End of Operations in Armenia. Operations in Persia follow on p. 185.)

**The Balkans**

[The Strategy of the Balkan Peninsula. By T. Miller Maguire, LL.D., *United Service Mag.*, Nov., '15. 3500 words.]

(Note.—The principal part of this article is taken up with a discussion of the political and strategical importance of the Balkan Peninsula from early times, and a statement of the peculiar lines of cleavage in the present war as compared with former conflicts, most of the belligerents being now at war with their protectors or allies of the past.)

Mr. Amery, M.P., recently visited the Balkans and he thinks it impossible to exaggerate the importance of the events in that theater. If the Germans and Bulgars crushed Serbia, Germany would through Bulgaria get into touch with Turkey. This would mean unlimited ammunition for the Turks. The position of the British troops there has been far more difficult than press censorship and smooth speeches of the government have led people to believe. The one mitigation was Turkish lack of shells, but the crushing of Serbia would remove this. There are a half to three-quarters of a million Turks who can be made into soldiers when arms are forth-



coming, a substantial addition to the Teutonic forces that would go far toward restoring their permanent losses by war. There would be free passage for German agents, machine guns, rifles, etc., as far as Afghanistan, and thus there may appear German guns on the northwest front of India within six months. The Bulgarian and Turkish wheat harvest and the resources of Asia Minor will become available to Germany.

(This was written before the defeat of Serbia was an accomplished fact, and ended with a plea to take such action as would prevent this issue of the campaign.—Ed.)

[The Levant. By T. Miller Maguire, LL.D. *United Service Magazine*, Jan, '16. 3000 words.]

A discussion of the politics, diplomacy, and moves regarding the Balkan states from a British standpoint.

April

[The Fall of Belgrade. By a Serbian Officer. *Fortnightly Review*, Feb 16, '16. 3800 words.]

When it became evident that we were going to have trouble with Bulgaria, we started to concentrate on our eastern border. But the Allies would not let us attack Bulgaria, and selfishly tried to make us yield to Ferdinand's demands. When the Bulgars were ready, they opened hostilities with every certainty of success, as we numbered only 200,000 against 600,000 Austro-Germans and Bulgars.

The defenses of Belgrade had never been very strong. Besides our own troops, with a few howitzer batteries and siege guns, the French had posted three 9-inch guns, the British eight 4.7-inch naval guns, and the Russians four naval guns. There were also available for the defense several mine fields, some floating torpedo batteries, and an armed patrol boat.

Except for the noise of the enemy's concentration across the Danube, and an occasional shell, everything was quiet at this time, and the city was very gay. On Oct 4 there was considerable firing, and on the next day the bombardment of the city and the fortress commenced in earnest. It continued on the 6th. Seeing that the enemy had 150 guns to our 30, we realized that the game was up. On the 7th, the Austrians effected a crossing; most of that day I spent watching Belgrade being knocked to bits.

[The narrative of the flight from the city is continued by the writer, who appears to have had no military duties, and to have been principally concerned about leaving his piano and foregoing the luxury of a bath.]

May

[Rumania's Attitude. *Independent*, Apr 24, '16. 600 words.]

Bucharest announces the conclusion of a commercial agreement with Germany which principally allows Germany to get Rumania's surplus of grain, about 100,000,000 bushels. This action of Rumania is doubtless dictated by the course of events, for her sympathy is pro-Ally. But England failed to open the

Dardanelles and Rumania has no access to the Allies except to Russia, and Russia herself produces a surplus of grain. Rumania's decision was apparently held to await the opening of the spring campaign. With the Germans on the offensive at Verdun, Rumania apparently thinks the Allies have little chance of winning.

### The Dardanelles

[Some Truths about the Dardanelles. By Sydney A. Moseley. *Contemporary Review*, Nov, '15. 3000 words.]

(A general discussion of conditions, dealing principally with the morale of the military force. Among the outstanding statements are:—)

The posts of the Intelligence Department should be filled by Englishmen. Foreigners should not be trusted in the important duties of these offices. The War Office should train enough Englishmen to read and speak foreign languages so that foreigners need not be relied on.

Inoculation is absolutely necessary. The unanimous opinion of scores of officers in the hospitals may be summed up—"Only a fool goes to war without being inoculated."

The letter post was well administered, but the parcel post not so. This maladministration gave rise to grave discontent. "The parcel theft caused more heartburning among our men than any defeat."

The Suvla landing showed excellent personnel but faulty methods of execution. Secrecy concerning the landing stages was mishandled, in telling those who ought not to have known, and neglecting to tell those who should have known. Thus the Turks were apprised. Brigades found themselves misplaced, reserves in the front line, officers received no orders, and other like mistakes were made. The only comfort is that there are similar blunders on the part of the enemy.

The absence of bands and other items that might have operated in some measure to dispel gloom is criticised.

May

[The Dardanelles Operations: General Sir Ian Hamilton's Dispatches. *Australian Mil. Jour.*, Jan, '16. 9500 words. Two illustrations.]

(Note. This dispatch covers the Dardanelles operations from May 5 to July 1, 1915. A general outline only will be given.—Ed.)

A previous dispatch describes how, during ten days and nights of fighting, the troops had forced their way in about 5000 yards from shore. It now became imperative to gain more ground inland so as to relieve the stress due to being under fire in a crowded position.

For three days, May 5-8, the British attack against scientifically prepared positions was prosecuted with great determination. The gain was small. The first two and one-half hours fighting made a gain of but 200 to 300 yards. Everywhere the attack was held up by concealed machine guns. The inability to locate these is repeatedly mentioned. In one case the attack swept past the machine guns without discovering them and they

**EUROPEAN WAR—Continued**

opened on the reserves with deadly effect.

After three days of fighting, the net result was a gain of 600 yards on the British right and 400 yards on the left and center, and this gain had to be maintained against violent counter attacks.

On May 11 it was possible to withdraw one division from the actual firing line. This withdrawal gave no respite from shells, but at least the men were, most nights, enabled to sleep."

After this fighting it was observed that "advances must more and more tend to take the shape of concentrated attacks on small sections" of the front, after artillery preparation. Siege warfare supervened. Consolidation and fortification of the front, improvement of approaches, selection of machine-gun emplacements, and scientific grouping of artillery under centralized control then occupied attention.

[Australians in Action: Operations at the Dardanelles. Letters from C. E. W. Bean, Australian Press Representative with the Australian Imperial Force. *Australian Mil. Jour.*, Jan, '15. 55 pages.]

(NOTE.—Under this caption is published a series of letters dated between Aug 2, 1915, and Oct 22, 1915, and giving a graphic description in detail of the fighting at Anzac (July 31), the charge of the Light Horse (Anzac, Aug 7), Lonesome Pine (Aug 6-11), Sari Bair (Aug 6-11), Knoll 60 (Aug 21-22, and 27). These descriptions are vivid and in detail, and show the terrible intensity of the fighting. One or two points only stand out as novelties in trench warfare. In one account is mentioned a Turkish artifice of having night patrols which are trying to locate concealed rifle and bombing positions carry along some object to be thrown on the ground near where the position is located. This mark then serves to direct fire upon the locality the next day. Another new point is that of Turkish trenches at Lonesome Pine so strongly roofed over as to prevent access when an attack reaches the position. Communicating trenches are in this case underground.

Then follows a letter describing the operations of an Australian Bridging Train organized by the Australian Navy. They built a barrel-pier jetty at Suvla, and erected a pontoon pier, 130 yards long, for embarking wounded. The pier was prepared by rafts, which were rowed the mile and a half to shore. Twenty minutes after touching shore the pier was complete and anchored in position.

The next letter describes an individual act of heroism, in which the statement is made that in scouting between the intrenched lines the greatest danger is in coming back rather than in going out, and that with bold men, prepared for concerted action without hesitation, the enterprise succeeds surprisingly often. Then follows a letter concerning certain criticisms of the Sanitary Service.

This is digested separately, and appears under that heading.—Ed.)

[The Evacuation of Gallipoli. By Sydney A. Moseley. *Fortnightly Review*, Feb, '26. 2700 words.]

Although the withdrawal from Gallipoli was accomplished with credit, one cannot help reflecting that the leaders were more successful in conducting retreats than in straightforward advances. The whole series of operations in the Dardanelles was characterized by mental inertia, indecision, and faint-heartedness; nowhere was exhibited that strong, clear leadership which is so necessary. Sir Ian Hamilton's stand that withdrawal from the Peninsula would be "unthinkable" is worthy of British traditions; how much better if he had been equally insistent earlier on the need of reinforcements for his task!

No one can claim that the attempt to take Constantinople should never have been made. At the worst, the presence of the attacking force immobilized the flower of the Turkish army, and postponed the grand attack which the Turks promised to make on Egypt after their first defeat.

One feels that the Commander-in-Chief would have been better served had he remained in closer touch with the operations. Arrangements for signalling, and for motor-boat service to and from the Island of Imbros, were anything but satisfactory.

The question will always be asked, Should the whole enterprise have been abandoned? We took a sporting chance at Suvla and lost. But to abandon Suvla and Anzac was not necessarily a preliminary to a complete withdrawal. The latter came as a severe shock. The Turks were morally a dejected army; and a determined offensive, after General Monro's arrival, "might have been" crowned with success.

Gallipoli, then, was a tragic failure—the lessons of which must be fully heeded!

From May 11 to June 4 continual pressure was exerted against the enemy by local operations.

The Anzac position formed a rough semi-circle inland from the beach of Anzac Cove, with a diameter of about 1100 yards. On May 9 (night) an effort was made to extend the holdings. This was successful but the gain was lost through a counter attack by the Turks the next night. On May 18, Anzac was subject to violent bombardment by the Turks, and about 4 a.m., May 19, a very heavy attack, said to have been participated in by 30,000 troops, was made and repulsed with heavy loss. Followed an armistice from 7:30 a.m. to 4:30 p.m., May 24, for the burial of the dead. The position known as Quinn's Post at Anzac remained a center of activity.

Now ensued the general attack by the British force on June 4. The Turkish trenches ran from the west of Kereves Dere in a northerly direction to the sea. The British line of battle was occupied from right to left in order by, (1) The Corps Expeditionnaire;

(2) the Royal Naval Division; (3) the 42d (East Lancs.) Division; and (4) the 29th Division. The length of front was rather over 4000 yards. There were 24,000 infantry available, which permitted the formation of a reserve of 7000 men.

A bombardment commenced at 8 a.m., June 4, and continued till noon, when the guns increased their range and the infantry advanced to the attack. Ground was gained along almost the entire line, but much of it was subsequently yielded to the ensuing Turkish counter-attack. The net final result was a British gain of 200 to 400 yards along the whole of the center, a front of about three miles. Now followed until the end of June incessant attacks and counter attacks that piled up a heavy total of casualties. Three of these actions, one each on the French, the British, and the Australian and New Zealand fronts, are described to show the character of the demands on the troops.

Summing up, the country was broken, mountainous, arid, and void of supplies; the water was inadequate; the area occupied was very cramped; with the wind in certain quarters no landings were possible, and the wastage of small craft and lighters was heavy and led to serious difficulty in supply; and over each beach played "fitfully throughout each day a devastating shell fire at medium ranges."

The Royal Army Medical Service is praised for its work under difficult conditions. It is not as easy to keep everything in order under shell fire as some critics imagine. There were no roads, and wounded and attendants might be shelled on their way to the beaches, and occasionally through inadvertence, even on the lighters on the way to the hospital ships.

(Then follows a supplementary dispatch of Sept 22, 1915, giving the names of 174 men whose services deserved special mention.)

[Coast Defense Studies—V. (continued.) The Attack on the Dardanelles. By J. L. Cardeiro, Capt. of Artillery. *Revista de Artillaria*, Feb, '16. 8000 words.]

(A brief account of the allied operations in the attempt to force the Dardanelles.)

See also

DARDANELLES, OPERATIONS AT THE (1915)  
SALONIKI, OPERATIONS AT

*Asia Minor*

[European War Operation in Persia and Mesopotamia. *Vaenny Sbornik*, Jan, '16.]

*Caucasus Front*

Dec 5, 1915. Continuous reconnaissance on the entire front, from the Black Sea to the vicinity of Khorasan on the Arax River.

Dec 6. Near the Black Sea to the southwest of Kop, the Turks attempted an advance which was unsuccessful for them, and in which they suffered severe losses.

Dec 15. Defeated several squadrons of Kurdish cavalry north of Ardshin (near Van).

Dec 16. Fighting near Kestaspur (southwest of Ardanuch).

Dec 18. A detachment of scouts near Ishkan attacked some Turks with the bayonet, and were themselves attacked from the rear by another party of Turks. In turn, they were rescued by a second detachment of Russian scouts.

Dec 20-21. During this night the Russian advanced parties by a vigorous attack drove the Turks out of their trenches on the front, Akapootinsev Hill (18 miles southwest of Olit), and then continued forward. The Turks now receiving reserves, delivered four counter attacks, which were all repulsed with great loss to the Turks, due to the effect of the Russian artillery fire.

Dec 21-22. Heavy fire was delivered by the Turks on the new positions of the Russians.

Dec 23. Skirmish southwest of Kop by Russian motor detachments.

Dec 24. Heavy firing was directed on Turkish works near Savri-Shaya.

Dec 28. More firing on Turkish works near the Black Sea and southwest of Ak-Dag.

Dec 29. Weak attempts made by the Turks to cross the Arkav River, south of Kop. On this same date fire was directed on the Turkish entrenchments near Ardost.

Dec 30-31. During this night the Turks attacked near the Kara-Dash hill, using bombs with asphyxiating gases.

Jan 1, 1916. The Russian cavalry unexpectedly attacked Kurdish cavalry near Kop and defeated them.

Jan 2-3. This night the Turks attempted a bayonet attack in the Black Sea region, but they were everywhere repulsed by fire action.

[Operations in Armenia. By M. B. *Vaenny Sbornik*, Apr, '16. 1100 words.]

Mar 5. Russian troops entered Manavr.

Mar 7. The advance on Trebizond this day reached Reza, 37 miles east of Trebizond, and on the Black Sea the Russian fleet was now able to support the advance of the right wing of their army.

Mar 11-12. Fighting occurred west of Erzerum, where the Turks were defeated, with a loss to them of 2 officers, 336 men and 2 mountain guns.

Mar 13. The Russians captured 19 officers and 250 men.

Mar 14. Mamakatum, 60 miles west of Erzerum, on the main road, was stormed and captured by the Russian troops. This town, prior to the war, had been the headquarters of the Turkish X Corps. Five guns, 44 officers and 770 men were taken with the town.

Mar 14-15. The Turks counterattacked west and south of Mamakatum, but without obtaining any success.

Mar 18. The Turks attacked on the front along the Black Sea, but were everywhere repulsed.

Mar 20-22. Fighting along the Black Sea.

Mar 23. A general advance of the Russian forces commenced.

Mar 24-25. Considerable fighting occurred, both on the Black Sea front and to the southwest of Bitlis.

Mar 26. The Turkish position along the

## EUROPEAN WAR—Continued

Black Sea was stormed after the advance of the Russian infantry had been prepared by the field artillery. Notwithstanding heavy counterattacks by the Turks, the positions seized were held and the advance reached Of, 25 miles east of Trebizond.

Mar 27. The Turks again counterattacked, but were again repulsed, with severe losses to them. Advances continued also beyond Moosh and Bitlis.

Mar 30. The Russian advance reached this day a point 20 miles south of Moosh, but only after severe fighting. On this same day an enemy submarine sank the Russian Red Cross ship *Portugal*, with a loss of 115 souls, among which were many Sisters of Charity.

Mar 31-Apr 1. Further fighting with the Turks, who lost another 100 prisoners in various engagements.

[The War in the Levant. By General Maléterre. *Revue des Deux Mondes*, May 1, '16. 7500 words.]

The cannon of Verdun have caused the taking of Erzerum to be forgotten. Now that the battle of the Meuse, after two months of desperate combats, constitutes decisively the gravest check met with by the Germans since the Marne and the Yser, and probably marks the decline of their offensive strength, it appears opportune to return to that theater of operations in the Orient in which the Allies have experienced many disappointments and reverses, but which is still of great importance.

If the Allies, profiting by the fine victory of the Serbs over the Austrians in Dec, 1914, had resolutely entered the Balkans through Saloniki instead of allowing themselves to be hypnotized by the forcing of the Dardanelles and the chimera of the reconstitution of the Balkan union, who can doubt today that Constantinople and Turkey would have passed from the hands of the Germans into those of the Allies, that Greece, Bulgaria and Rumania, in spite of their German sympathies, would have been drawn along towards the Danube, and that a junction with the Russians would have been made in the Hungarian plains?

One wonders how diplomatic circles could forget that the Oriental question was the direct cause of the present war, and that it held a preponderant place in the vast program of Pan-Germanic imperialism.

For twenty years, Germany has made a great effort in the Orient, an effort which has resulted in her mastery of Turkey, the defection of Bulgaria, and the inertia of Greece and Rumania. In case of an early settlement she would want to balance by compensations in the Orient concessions forced by the European frontiers.

The Allies could not commit a graver mistake than to abandon the Orient to Germany. Nothing would have been changed in the condition of Europe save that several million young men would have given their lives to no purpose. A glance at the map will show the solid block that would be formed by the Cen-

tral Empires, the Balkan States, Asia Minor, and Mesopotamia, separating thenceforth Russia from western Europe, joining the North Sea to the Persian Gulf and to the route to India, dominating the magnificent eastern shore of the Mediterranean and the Suez Canal.

It may be said that everything will be settled on the great fronts of France and Russia, and that when we are on the Rhine and the Russians on the Oder, the Oriental question will be solved, as well as that of Alsace-Lorraine. But it would seem, when we consider the terrible battles yet to be fought against the barbed wire and fire curtains that will continue to cover the successive German lines of resistance, that the Allies have the greatest interest in striking the adversary in the Orient, his most sensitive point, perhaps.

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The taking of Erzerum was a surprise for the belligerents. The Army of the Caucasus might have been supposed to be in winter quarters, and its sudden awakening raised the question as to whether it was opening a new campaign, premeditated and of great scope, or whether it was only a sudden attack which would have no consequence beyond the taking of the fortress. It soon developed that the Russian columns were not only pursuing the Turks, but had the following definite objectives: Trebizond, Erzerum, Bitlis.

It is not without interest to sum up what the Army of the Caucasus has done since the beginning of the war.

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When Turkey, already Germanized, took sides with the Central Empires, her armies, newly organized by Enver Pasha and the German general Liman von Sanders, were distributed, as usual, in Thrace, around Constantinople, in Syria and Mesopotamia, in Armenia, and in Arabia. We do not know whether there was then a plan on the part of the Germans and Turks to make an offensive against Egypt, favored by the surprise caused by Turkey's determination. But to thwart that, England had only to stop the colonial contingents that were traveling through the canal. And we know that the allied fleet tried to force the Dardanelles in Nov, 1914. At about the same time, an Anglo-Indian expeditionary corps disembarked at Koweit and rapidly seized Bassorah, threatening Bagdad.

Consequently, the Turks had to oppose the double attack, logical enough, which aimed at Constantinople and Bagdad, the two heads of the Ottoman Empire. Between the two they might fear an offensive of the Russians of the Caucasus on Armenia, a traditional battleground. Now on this side, Turkey had important forces, the Ninth, Tenth and Eleventh Corps; they were reinforced by the First Corps, and one division of the Thirteenth, bringing the total to more than 150,000 men.

The Russian Army of the Caucasus had been depleted to aid the armies of Poland and Galicia, already engaged in terrible battles. Its mission was rather defensive on the Armenian

side and the side of Persia also. Not that she had to fear aggression from this latter country, very much troubled by internal dissensions, but because the Turks could approach the Trans-Caucasian province as well by the Persian Azerbeidjan, and Taurus routes, as by the direct routes of Kars and Erivan.

These two cities, Kars and Erivan, had a fatal attraction for the Turkish offensive; they are the two capitals of the part of Armenia ceded to the Russians by the Treaty of Berlin of 1878. The principal mass of the Turkish army concentrated quite rapidly to the northwest of Erzerum, on the roads of Kars and Ardahan. At the end of December, it attacked vigorously the Russian right wing. The First Turkish Corps entered Ardahan, while the Ninth and Tenth Corps debouched suddenly on Sarykhamich, southwest of Kars, turning and taking in reverse the Russian center which had advanced on the Erzerum road as far as Kepri-Keni, and which was engaged with the Eleventh Corps. The German method may be recognized in this movement: trying to come down on the center and to envelop the wing by a wide wheel.

The Russian commander was able to profit by the inclement weather (snow storm) and the mountainous country to withdraw his troops before they were surrounded. The heroic resistance of the rearguards retarded the Turks, and permitted the Russians to bring up their reserves and to counter-attack. They fell upon the Ninth Turkish Corps, which was nearly annihilated, then on the Eleventh, which had advanced near Sarykhamich, and it was crushed in its turn. On the 15th of Jan, the Russian victory was complete. The Turks fled in disorder on Erzerum. This brilliant victory had no other result than to break the Turkish offensive. The Russians could not pursue their successes and try to seize Erzerum; they were not in sufficient force and the winter was rigorous. Besides, Turkish forces had advanced in the Azerbeidjan and had occupied Tebris (Taurus). They did not stay there long: the Russians drove them out at the end of Jan. But the Persian situation became serious. German agents had been exciting the passions hostile to Russians and English, and Turkey's entrance into the war threatened to rouse the Mussulman world.

This was indeed what the imperial policy had hoped. It must have been one of the Kaiser's most cruel disappointments to see not only the indifference that the Mussulman world in general displayed to the alliance of the Turks and Germans, but also the devotion of the Hindoo and African soldiers to England and France. (However, we must not neglect the pro-German sentiments sustained in Egypt by the preceding Khedive and the results of the propaganda of German agents in Africa, especially in Tripoli and Morocco. A defeat of the Allies in the Orient might have serious consequences.)

After the recapture of Tebris, the Russians proceeded to occupy Persia slowly and methodically, using only the necessary forces.

The two armies remained facing each other

during the whole year of 1915, without any other events than the advance of the Russians in the Lake Van region and the occupation of Van. The Turks, on the other hand, were solidly established in the region of Olty, covering Erzerum. The Armenian theater of operations appeared secondary as compared with the great western front and the one in Poland, even as compared with the Dardanelles. Towards Bagdad, also, the situation was stationary.

At the end of 1915, the Allied cause seemed much compromised in the Orient. The treason of Bulgaria, the crushing of Servia, the definite junction of the Austro-Germans with Constantinople, raised up faltering Turkey, and made vain all the heroism and sacrifice at the Dardanelles. The Turks talked of nothing less than setting out, with the aid of the Germans, for the conquest of Egypt.

The face of things was changed by the decision of the Allies to stay at Saloniki. Tardy though it was it annihilated the whole effort made by the Central Powers in the Balkan campaign of last autumn; it provided for the future. By concentrating at Saloniki a powerful army the Allies hold in suspense the victory that the Central Powers believed they had won, and also keep Allied liberty of action in the Orient.

The resumption of Russian offensive operations in Armenia is the first manifestation of it.

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The arrival of the Russians before Erzerum and the assault of that city were prodigious feats. The troops that accomplished them belong to those corps of the Caucasus that are stopped by nothing.

The city of Erzerum, which is at an altitude of 2000 meters, is situated in one of those plains the basins of old lakes frequent on the high Armenian and Anatolian plateaus. The west branch of the Euphrates, or Kara-Sou, comes out from the mountains, and flows through the marshes that cover the northern approach to the city. Erzerum is situated at the foot of the slopes of the Devé-Boinou, on which are the advanced forts towards the East.

Erzerum is a very old city. It is at the junction of the most direct routes between Mesopotamia and the Black Sea, and between Canaan and Asia Minor. Its name means "land of the Romans." Its very mixed population of Armenians, Persians and Jews hardly exceeds 50,000. Its strategic situation has made it a fortified place. At first surrounded by ramparts, the citadel, dominated by the neighboring heights, was unable to stand attack by cannon. Under the direction of the Germans, the Turks have made it an intrenched camp of special form. The whole defensive organization is turned towards the east, and bars the roads from the Caucasus, particularly the road from Kars.

Erzerum, protected as it was by modern forts, had become the great center for supplies and reserves of the Turkish army of Armenia. The value of its fortifications, the

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power of the Krupp guns, the very excellent matériel which was concentrated there, the numerical strength of the garrison, and the presence of the third Turkish army, seemed to make a rapid fall of the place unlikely. This war has given us many surprises as to the vulnerability of fortified places. Save that of Przemyśl, these sieges have not lasted more than a few weeks. The taking of Erzerum in five days, in the dead of winter and without the aid of heavy artillery, is believed to be without a parallel in the history of wars, particularly as it coincided with the defeat and rout of an army that might have rallied on the fortress and prolonged the resistance. The master hand of the Grand Duke Nicholas is recognizable in the art and secrecy with which the operation was prepared.

Until the end of December, the Turkish general staff suspected nothing. Even when the first engagements testified to the resumption of the Russian offensive, the politicians of Constantinople attached no importance to it. All available forces were being used in Thrace, Syria and Mesopotamia. An attack on Egypt was being prepared. It was only when it was learned that the Cossacks had appeared near Erzerum, and when the defeat of Kepri-Keni became known that the Turkish divisions of Syria were hurried to Angora, and that Sanders Pasha was made commander of the army of Armenia.

The plan of the Grand Duke Nicholas appears to have been to attack the Turkish center before the thaw set in. The flank corps of the Turkish army were at Olty and Lake Van, too far away to intervene in time, and besides they were to be held in check by strong detachments.

A regular siege could not be considered, first on account of winter, then because the Caucasus railway, Tiflis-Kars, did not go beyond Sarykhamich, 140 kilometers from Erzerum. The necessary heavy artillery could not be brought up. The Russian newspapers say that the soldiers were obliged to bring the field-pieces up the snow-covered slopes by hand, and that they fought, in January and February, in intense cold, in snowstorms, their burning faces breaking out in blisters. The success of this audacious campaign could only be assured by rapidity of attack.

The Army of the Caucasus attacked simultaneously Olty, Tortoum, and Kepri-Keni. On Jan 19, the panic-stricken Turks fled by the roads converging on Erzerum, abandoning wounded, prisoners, arms and ammunition. The Cossacks pursued and arrived on the glacis of the Erzerum forts at the same time as the Turks. The rout of the center was so sudden and the attack on Erzerum so rapid that the flank fractions of the Turkish army could not fall back on Erzerum, but were obliged to retreat, to the north by the valley of the Ichoruk on Baibourt, to the south by Mouch.

The Russians marched on Erzerum in three columns, on the north and east by the roads from Olty and Kars, on the south by the

Palanteken pass. The assault was immediate. The northern column captured the forts of Kara-Sulek and Tafta, turning thus the defenses of the Devé-Boinou. The center attack took the forts of Graz, Iopolaki, Aksi-Tchaka, Sievchli, while that on the south approached the Palanteken. It must be stated that the garrison defended itself desperately. It made energetic counter-attacks over the frozen marshes of the Kara-sou and on the slopes of the Palanteken. But they could not resist these Russians, who came down from the mountains by letting themselves slide seated on the snow, coming at full speed as if they were falling from the clouds.

A skillful maneuver of the northern column enveloped the Turks who were resisting on the plain. Then the third line of forts was assaulted. The Cossacks entered Erzerum, went through the city and hurled themselves in pursuit of the remnants of the garrison and of the third army, which fled by the Baibourt and Erzindjian roads.

It is to be noted that Erzerum did not capitulate. The place was evacuated by the decimated Turkish divisions. It could not be invested. But the booty was enormous. Not only did all the armament of the entrenched camp fall into Russian hands, but the third Turkish Army lost nearly all its field artillery and left a great number of prisoners.

This unheard of assault lasted for five days and five nights. All honor is due to the Army of the Caucasus and its chief, General Youdenitch, for one may imagine the terrible nature of the combat, the scaling of these snowy glacis, and the capture of the ice-covered trenches.

Before advancing directly from Erzerum to Erzindjian, it was necessary to drive back all the Turkish corps which were escaping by the valley of the Ichorok, and in the Mouch region by the valley of the lower Euphrates (Murad Sou), and to seize Trebizond, the great Black Sea port, and Bitlis, near Lake Van.

The possession of Trebizond is of first importance to establish connections by sea. The Russians, therefore, marched on Trebizond and, at this writing, a dispatch announces its capture. Further operations are facilitated.

Bitlis is one of the gates of the Armenian Taurus; it opens the direct route to the Tigris and to Mesopotamia. Mouch and Bitlis were occupied very quickly. The whole region of Lake Van has been cleared. But the Russians are confronted by the Kurds, who hold the southern slopes of the Armenian plateau.

It is rather difficult to indicate the exact positions of the Russian vanguards. We may judge that they have advanced on all the roads leading out of Erzerum, covering the necessary concentrations. (The last Russian reports announce that Turkish attacks against the center of the Russian army have been repulsed. There has then been a Turkish offensive return, which is explained by the arrival of reinforcements.)

The front on which this army is operating is very extended, from Trebizond to the fron-

tier of the Persian Azerbeidjian. But the mountainous character of these regions permits economy of forces by concentrating on the roads which follow the great valleys, the only ones practicable for artillery and convoys, and keeping up connection by small detachments. Nevertheless, if the present Russian advance is only the prelude to great operations in the Levant, the commanding general probably has several hundred thousand men at his disposal.

The theater of war differs from those of Europe, not so much in the relief of the ground as in the lack of communications, especially railroads.

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The operations in Asia Minor have a close relation to the Balkan operations, for they have the same objective, Constantinople; that is to say, the ruin of the Ottoman Empire and, as a result, the defeat of Germany and the solution of the Oriental question to the profit of the Allies. But it is certain that Saloniki is closer to Constantinople than Erzerum and Bagdad, and that the principal attack should start from the most advantageous base of operations. Anything which may second this principal attack, divide and divert the enemy, deprive him of his resources, should none the less enter into strategical offensive operations. Now Asia Minor is the reservoir of Turkey's army and her source of food supply.

The attack on the Dardanelles was logical, it aimed at Constantinople on the shortest line, and the possession of the straits would have had a doubly fortunate consequence; it would have assured the junction with Russia, it would have cut the Balkans off from Asia Minor. It is impracticable to undertake the attack again, since the Bulgars have joined the Turks. Before entering Constantinople, the Bulgars must be beaten and Sofia entered.

But it is reasonable to suppose that the Saloniki offensive will receive great support if the Turks are obliged to confront the Allied Armies in Asia Minor. This does not mean, of course, that Saloniki will wait till the armies of Erzerum and Bagdad are on the Asian shores in sight of Saint Sophia. But the entrance of these armies into Anatolia and Syria would decide the fate of Turkey.

It remains to be seen if that is possible. The Russians and English should combine their operations in such a manner as to join and to march on Constantinople. The most feasible points of junction would seem to be Aleppo and Alexandretta. There is reason to believe that the Russians could arrive first in this region. The British might aid them by disembarking at Alexandretta. There is still time to send troops from Egypt there, unless they have already been transported elsewhere.

It is necessary to act in the Orient. Immobility and inaction are signs of weakness in Oriental eyes. If the Russians and English should establish themselves on the front Trebizond-Sivas-Alexandretta, the consequences would be great. Mesopotamia, Syria, and Ara-

bia separated from the Ottoman Empire, Arabs and Syrians would join the Allies. The Turkish armies, obliged to defend Anatolia, could no longer participate in the Balkan operations.

There is still time to make the effort necessary. Germany will not stop the frightful human hecatomb until the Orient is decisively wrested from her. And we are convinced that this first defeat could be the prelude to a Germanic reflux on the Rhine and on the Oder.

#### Mesopotamia

#### March

[British Mistakes in Mesopotamia. *Army and Navy Jour.*, Feb 12, '16. 700 words.]

The British attack at Ctesiphon was made at noon, Nov. 22, after a night march, and was at first a success for the British. They failed to carry the second line and were counter-attacked by the Turks, who had been reinforced. The struggle continued with the British dug in and on the defensive most of the time throughout Nov. 23rd, 24th and 25th. The British sustained casualties of 4500 in the fighting and retreat, indicating a force of probably one division. If so, they were outnumbered by the Turks only about 3 to 2, and the defeat speaks well for the morale of the Turkish force. The British mistake was in undertaking the expedition with too small a force. It would have been far better for the British troops at Kut to await the arrival of the divisions that are now trying to fight their way to them.

[The Tigris Campaign. Strategic Value of British Operations in Asia Minor. Situation on the Verdun Sector. By Hilaire Belloc. *Land and Water*, Apr. 27, '16. 6700 words. 1 sketch.]

Whether the small force now contained at Kut-el-Amara be compelled to surrender or not, the strategic value of an advance on Bagdad, and the consequences that will presumably follow upon that advance, in any event remain.

The Mesopotamian campaign must be considered in its relation to the whole field of the war, and not as an isolated adventure.

Before the war had been in progress a month, the bad strategy of the German Staff had destroyed their advantage of initiative and discounted most of their advantage of numbers on the western front. The Battle of the Marne was the turning point of the war. By Nov. 11th, 1914, the Germans were definitely contained on the West. British supremacy by sea blocked the enemy's supplies from the outer world to an extent only limited by the policy of the Government towards neutrals.

The enemy had two opportunities to counter this state of affairs. He could put Russia out of action and obtain a separate peace from that power, or he could endanger the political position of France and England throughout the Mohammedan world. Early in the war the support of Turkey was obtained. Had the British been less active, the Turkish Empire could easily have overwhelmed Egypt.

**EUROPEAN WAR—Continued**

There were men enough in Turkey at the same time to drive back the Russian garrisons south of the Caucasus, and to move against Persia. The British took the initiative vigorously. The forces in Egypt were increased, the Dardanelles attempt was made, important points in southern Persia were observed, and a small detachment was sent up the Tigris to threaten Bagdad. The Turkish line of communications to Bagdad is by rail to Aleppo and Ras-el-Ain, from the latter point to Mosul by wagon road, thence by water down the Tigris to Bagdad. The Russian advance through Asia Minor seriously threatens this line. Should the column at Bitlis reach Diarbekr in any strength, the entire province of Mesopotamia (known by the Turks at Irak) would be in peril.

A small Russian column is also moving westward through Persia against Bagdad.

The Turkish forces are roughly divided into three bodies: the Syrian groups, centering at Damascus; the Armenian groups, centering at Erzingan, and the Mesopotamian groups, centering at Bagdad. There is no longer any question of an advance through Syria towards Egypt. The whole question for the Turkish high command will be how to hold Mesopotamia.

The attention of an impartial observer of the strategic problem will be fixed, not upon the military value of the small force at Kut under General Townshend, but upon the combined positions of the main British force on the Tigris, the advancing Russian columns on the north and east, and the Turkish body between them all and menaced by them all.

\* \* \* \*

(Digest of remainder of this article will be found elsewhere under its proper heading.—)

[The Battle of Verdun is Won. Mesopotamia. By Hilaire Belloc. *Land and Water*, May 4, '16. 4800 words. 2 sketches.]

(The discussion of the battle of Verdun will be found under that heading in its proper place.—Ed.)

The fall of Kut means the loss of nearly 3000 British troops, about one tenth of one per cent. of the trained British forces. The situation commits the Turks to the Mesopotamian position. The maintenance of this distant salient is essential to the present rulers, who fear that with the loss of it their power of government may be destroyed.

It is a front thrust out so far beyond the Armenian theater of operations that its communications are in ever-growing peril. The whole thing really resolves itself into the question of whether or not the Turks can protect their lines of communication. Officers who have local knowledge seem to be of the opinion that they cannot do so.

The distance from Muslimje, the junction twelve miles north of Aleppo, to Bagdad via the Tigris route is over seven hundred miles. This is the main line of communications. The railroad extends through Ras-el-Ain to per-

haps as far as Amude. The railroad is completed up the river from Bagdad to, and maybe beyond, Tekerit.

The second line of communications, from Jerablus down the Euphrates, is about the same in length, but is less convenient. On the other hand, it provides better directions and opportunities for retirement. This route is supplemented by a possibility of petrol traction along the two historic ways that lead from Syria to the Euphrates.

The better of these ways is that which leaves the Syrian railway at Homs, passes the ruins of Palmyra near Erech, strikes the Euphrates at Abukemal and makes for Ana, where there are ferry boats for crossing heavy vehicles. Two and a half days is the time taken to make the journey by automobile. The provisioning of a force of several divisions by motor lorries alone over a space of nearly five hundred miles would be a formidable task.

The river route from Jerablus is open to the objection that shifting sand banks in the stream-bed make towing difficult and slow.

The junction of Muslimje, near Aleppo, is the nodal point upon which the security of the Turkish armies in Mesopotamia and Syria depends. A blow delivered against Aleppo from the sea would be decisive. The reasons against such an undertaking are not open to debate at this moment, but they are not conclusive.

[Mesopotamia. By Col. Sir T. H. Holdrich, K.C.M.G., K.C.I.E., C.B. *Journal of the Royal United Service Institution*, May, '16. 2500 words.]

England's possession of India necessitates her command of the Persian Gulf, and the importance of the Persian oil fields demands that she dominate Mesopotamia.

Germany's extension of her Asia Minor railway threatens English influence, and the German dream of an Eastern dominion would have precipitated a crisis sooner or later. To surrender such a commercial asset as the Persian oil fields without a blow would have seriously damaged British prestige in the mind of the Turk.

At the outset, a comparatively weak force with an inadequate river flotilla was dispatched to conduct a campaign in a country of which the natural difficulties had never been sufficiently appreciated.

The occupation of Bagdad was for political rather than for strategic reasons; though the holding of Kut was necessary to control the tribes of lower Mesopotamia and the grain output of that region. The possession of Bagdad would have exercised great influence over the Mohammedans of the entire East; and General Townshend and his gallant Indian division made a masterly campaign for the prize. There seems still to be a good prospect of holding command of the lower Tigris and Euphrates valleys, thus opening up a prospective field of colonial importance not equalled by the recently acquired German territories in Africa and elsewhere.

The extensive irrigation and drainage



projects prosecuted before the opening of the present war under the direction of Sir William Willcocks were carried out in Turkish interests and with the assistance of Turkish engineers; and this undoubtedly has been a large factor in the feeling of the Turkish commanders when they openly expressed regret that they should be found fighting against the British.

See also

ITALY—ARMY  
KUT-EL-AMARA, SIEGE OF

FAR EASTERN THEATER

See

TSINGTAU, SIEGE OF

—Chronological History of, By Theaters  
[Digested from the notes on "Progress of the War" in the *Army and Navy Journal*, and from miscellaneous sources.]

### GENERAL

To most of the belligerent nations of Europe, the year 1915 has brought cause both for rejoicing and for regret. The German sees his battle lines flung far into hostile territory, west, east, and south,—but counts the cost in precious lives, and feels increasingly the food shortage caused by England's command of the seas, which his submarines have been unable to shake. The Englishman chafes at his failures, sees his armies everywhere too late, his expeditions bungled,—but yet he redoubles his efforts and doggedly bides his time, still proud of his fleet's unchallenged supremacy. The Frenchman sees a large area of his country laid waste and in the firm grip of the invader,—but reflects with pride and thanksgiving that France has stood the test so splendidly in a military and economic sense.

To the neutral observer, peace seems further off than a twelvemonth ago. Nowhere has a decision been reached. The great German offensive against Russia, whatever its result in provinces won, in men and munitions captured, certainly failed in its main purpose of crushing the Russian field army, and eliminating the Slavic power from the contest. The Serbian campaign, in itself perhaps the most brilliantly successful offensive of the war, cannot be decisive of the main issue, which must be fought out on the soil of the great powers themselves.

Perhaps the most conspicuous event of the month was the virtual abandonment of the Dardanelles expedition. By the removal of these troops from Suvla Bay, England admits to the world the complete failure of this ill-starred campaign. Better the loss of prestige in the eyes of the Balkan and Mahometan states, she has decided at last, than the further sacrifice of these 100,000 men, so much needed elsewhere. Another significant change in English policy was the removal of Sir John French from the supreme command in Flanders. The brilliant cavalry commander of the South African War had added to his laurels in the retreat from Mons, and in the movement from the Aisne to Lys, when the little English expeditionary army stood off such

superior forces. But though successful as a corps commander, Sir John was found less suited for the direction of large armies under the unique conditions of trench warfare. His services have been recognized by the title of Viscount and the command of the troops in the United Kingdom. Sir Douglas Haig, his successor at the front, has won his high reputation as commander of the First Army under French. General Sir Charles Monro takes command of the First Army in France; and General Sir Archibald Murray succeeds General Monro in command at the Dardanelles.

The defeat and pursuit of General Townshend's expeditionary force against Bagdad constitutes another reverse that has helped to arouse Great Britain as never before. The House of Commons, after an all-night argument, adopted Mr. Asquith's bill calling 1,000,000 more men to the flag, a step that will give England an army of 4,000,000 men, the greatest she has ever had. Whether or not conscription will be resorted to is not yet decided; it seems likely to be adopted in a modified form, so as to give the Government the necessary power to enlist unmarried men. Telling the House of Commons of his need for 300,000 laborers, the Minister of Munitions, Lloyd George, sounded the following alarm:

"We have been too late in this, too late in that, too late in arriving at decisions, too late in starting this enterprise or that adventure. The footsteps of the Allies have been dogged by the mocking specter of too late. Let not 'Too Late' be inscribed on the portals of our workshops."

The Balkans continue to present the most critical situation, both military and political. Not only has the Franco-British force effected its retreat into neutral Greece, abandoning the last corner of Serbia held by the Allies, but Saloniki itself is being fortified in anticipation of a possible attack. Greece seems to have opened the way for such an attack by granting to Germany and Austria, but not to their Bulgarian and Turkish allies, the right to invade her soil. The German advance has halted at the frontier, however, and appears content to await further moves by the Allies.

Roman advices declare that a considerable number of Italian troops have been landed on Albanian shores, whence they are to march into the interior to help the Serbs and Montenegrins and perhaps to attack Monastir, now held by the Bulgarians. Such a movement, if accomplished promptly and in sufficient force, would greatly relieve the Allied situation at Saloniki. However, the difficulty of moving across the Albanian wilds, traversed by only two roads, would probably prevent this maneuver from being carried out in time to affect the Saloniki situation. Moreover, considerable friction is said to have been caused already between Italy and Greece from considerations of Italian intentions in this zone.

Nor does the reported Russian move against Varna promise assistance to the Allies. This port was reported to have been heavily bombarded by a Russian fleet, convoying several

**EUROPEAN WAR—Continued**

transports; but the report was afterwards found to misrepresent the facts. Varna is not an ideal base of operations for a large army which might meet heavy fighting, 50 or 100 miles in the interior, such as the Bulgarians can oppose, now that the Serbian campaign is ended. A month ago, such a move would have done much to relieve the Serbs. It seems more probable, from recent developments, that the main Russian attack will develop on the Bessarabian frontier.

There is reason to believe that the German threat of an attack on Egypt is being taken very seriously by the English. The banks of the Suez Canal are being heavily fortified, and large reinforcements are reported to be arriving at Alexandria. Turkish troops with German officers, according to the reported plans, would constitute the invading force, and the existing railroads would enable the long route to be covered in a few weeks. Of the exposure to flank attack of this long line, parallel to the sea for half of its course, these plans say little.

Allied shipping has of late suffered heavily from the submarines of the enemy. A Japanese liner with a large sum in gold was sunk in the Mediterranean, and British, French, Belgian and Italian vessels have been torpedoed. The British ship *Zeddo* went down with a cargo valued at \$2,000,000. On the same day five ships were victims of under-sea raiders.

*Jan*  
Gazing at this great World-War, the observer feels a sense of ever-widening horizons. Now at the close of January, when the great Russian offensive in Bukowina has slackened, the chief interest of millions who read their morning paper is centered about a town on the Tigris, hundreds of miles from Europe, where an English column is striving to cut its way through to an English detachment, beleaguered by an immensely superior force of Turks. A Russian column, too, is reported only ten marches away, but with difficult country and perhaps strong hostile detachments to fight its way through. It is an extremely interesting situation, though one hard to follow from the meager reports and incomplete maps available.

It has seemed as if the policy of the Allies were to fight Germany in relays. The supreme efforts of England and France, of Italy, of Russia, all in turn, have not been timed so as to occupy the Central Powers simultaneously. Thus the latter have been able to concentrate on interior lines against successive offensives, and have chosen the times for their own vigorous thrusts. Late in December when the other battlefields of Europe were comparatively quiet, Russia chose to launch a tremendous drive against the southern end of the Teutonic line resting in Bukowina. According to her own reports, 800,000 men were engaged in this effort, and the losses on that great 80-mile-long battlefield were claimed to be some 75,000 on each side in a fortnight. No doubt the political

situation, as well as military considerations, has been instrumental in causing this campaign; Russia, if successful, so close to the Rumanian frontier, in winning Bukowina, might well aspire to win with it the allegiance of Rumania to the Entente,—Rumania with her five hundred thousand troops. Such a brand of Russian success seems so far quite out of reach; the Teutonic opponents were not found unprepared for this blow. Czernowitz, for the possession of which there has been fierce fighting, still remains in their hands; and despite slight advances for the Russians, the general alignment of the armies is unchanged.

However, if the Russian offensive has done nothing else, it has been a powerful deterrent to Teutonic plans of offense elsewhere. At one time the Teuton-Bulgarian forces massed along the Greek border seemed about to cross the frontier and try for the prize of Saloniki. There were good reasons to hesitate, not the least of which was the need of men to meet the Russian assaults. At any rate, there is little present indication of a move against the great Allied base, now strongly fortified and held by at least 200,000 men, under the supreme command of General Sarraill, the French commanding officer.

Montenegro has been added to the list of small states over which the tide of battle has rolled disastrously. Its gallant resistance won the admiration of the world, but received scant assistance from the Allies. Much was expected from Italy, on account of her jealousy of Austrian domination on the Adriatic, but the Italian forces reported a month ago at Avlona and Durazzo seem to have accomplished nothing. Operating from their naval base at Cattaro, the Austrians were able to seize the dominating peak of Mount Lovcen, scarce ten miles from Cetinje, and the fall of the Montenegrin capital followed shortly. There have been conflicting reports about peace negotiations. The proposals made by King Nicholas, it seems, have not been concurred in by the army, and the terms proposed by Austria, moreover, have been so harsh as to elicit the indignant refusal of the whole nation.

There is little news of great moment from the Western front. The most serious fighting of the month has centered about Hartmannsweilerkopf and in Champagne; the Germans have for the most part been the aggressors, and claim to have won back the ground lost in former French advances.

The Dardanelles campaign is ended. The fruitless effort was finally abandoned on Jan 9, with the withdrawal of the last of the English and French from the tip of the Gallipoli Peninsula. The withdrawal, according to the British report, was made very creditably, with only one casualty.

The largest and best ship that the British Navy has yet lost is the King Edward VII, which on Jan 9 struck a mine (location not stated), and was abandoned soon afterwards, without loss of life. She had a displacement of 17,500 tons, and carried four 12-inch guns.

The Mediterranean continues to be a field of submarine activity against Allied shipping, but to a decreasing extent. It now seems probable that the British passenger vessel "Persia," which was sunk on Dec 30 without warning, and with which went down several Americans, was the prey of a Turkish submarine.

In contrast with British failure elsewhere, Britain's sea-power stands forth a splendid achievement which furnishes daily evidence of its value. "German commerce is a thing of the past," writes F. H. Simonds in the *Review of Reviews*, "and Germany is to all intents and purposes a beleaguered fortress, not yet perhaps facing starvation, but plainly suffering from a shortage of certain kinds of foods, and many of the materials needed to make war."

Conscription has been a burning issue in England, which threatened to disrupt a cabinet. Despite opposition from the labor unions and other sources, the Government's compulsory service bill passed the Commons with a triumphant 110 to 1 majority. An addition to the Navy personnel of 50,000 men furnishes a measure of the ship-building activity that has strengthened the British fleet. As for the Army, 300,000 recruits have been called out from the number recently enrolled in Lord Derby's enlistment plan; a steady stream of men is going out to the colors.

The close of January, which brought to an end a year and a half of warfare, was marked by what seemed an intermission. Nowhere was any great campaign in progress involving daily changes in the war maps of the world. Military critics of the war devoted their attention to summarizing past achievements and forecasting future events, with an undiminished faith that their prophecies would be fulfilled. German triumphs on land were weighed against England's no less far-reaching control of the sea. A fresh realization was gained of the economic significance of the vast war debts that are being accumulated by the belligerents, at the rate of some one hundred millions of dollars every day. Elaborate statistics were compiled to show that the Teutons could not—or could, as the case might be—prolong the war for another year or years. Rumors of peace, and especially of a separate peace between Germany and Belgium, were not lacking; but nowhere was a sound basis for a present ending of the war suggested.

Then, as if this breathing space had ended, the guns roared again. On the western front, against the oft-contested vantage points in Artois and Champagne, the Germans launched fresh offensives. From Galicia and the country northwest came reports of renewed Russian exertions for the goals sought in that region. Finally, the Caucasian theater assumed a new importance with the fall of the Turkish stronghold of Ezerum—the first great triumph the Russians have been able to celebrate since their capture of Przemysl.

Russian victory at the Turks' back door has materially improved the situation of the Allies

in the far east, which constitutes a single strategic area. Thus the route into Armenia lies open to the Russians; the defenders of Kut-el-Amara, though 600 miles away, must feel the pressure somewhat relieved, while the invasion of Egypt, that forlorn hope which Germany is loath to renounce, seems to have been indefinitely shelved.

No important developments have occurred at Saloniki, despite persistent rumors that the Teuton-Bulgarian attack was going to begin immediately.

Italy's force in Albania, apparently so grudgingly and tardily sent, now seems more adequate for its task of holding Albania against the Teutonic and Bulgarian troops approaching Durazzo. There has been, however, a rather surprising dearth of news from this quarter.

The most serious air attack yet made against England took place on the night of Jan 31, when a squadron of six or seven Zeppelins passed over the Midland counties and dropped over 300 bombs. According to German accounts, bombs were dropped on Liverpool, Birkenhead docks and factories, Manchester, the blast furnaces at Sheffield, thus striking a blow at the heart of industrial England and justifying the raid by its results. The casualties reported were 100. That England is observing these raids with growing concern is evident from the tone of her press notices, the elaborate plans being perfected for defense against aircraft, and the demands made by many of her public men for reprisal against Germany.

Paris, also, was visited by a Zeppelin on the night of Jan 29. Concealed by the fog at a height of two miles over the city, the dirigible escaped safely from the thirty aeroplanes which went in search of it. The bombs dropped from such an altitude could not be carefully aimed, and fell chiefly in the tenement district, where they caused thirty-nine casualties.

Feb

No more audacious incident of the war has been recorded than the capture of the British passenger steamship *Appam* by a German sea-raider, and her voyage from the Canary Islands to Hampton Roads, Virginia, where she arrived Feb 13, under a German prize crew. The *Appam* had on board some four hundred and fifty people, mostly the passengers and crews of vessels destroyed by the raider. Lieut. Hans Berg, in command of the little prize crew, which piloted the *Appam* across the ocean, figured as a hero of romance in the published accounts of the voyage.

It must be disconcerting to the British government to find there are one and perhaps more German cruisers at sea which have eluded their vigilance. The *Moewe*, which is the name of the raider, according to Lieut. Berg, is a converted merchant steamer of about 6000 tons, with batteries fore and aft, ordinarily hidden from view by collapsible steel plates. She is thought to have run the blockade from Kiel, on Jan 1, under false colors, with the Swedish flag painted on her hull. In the week

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of Jan 10-17, the *Moewe* is credited with having destroyed no less than eight British merchantmen, valued at \$3,500,000. The largest among these was the *Clan MacTavish*, of 10,000 tons, which was sunk in battle after a game fight.

The case of the *Appam* presents a puzzling question of international law, as to whether she should be regarded as an auxiliary cruiser, and interned for the rest of the war, or whether, as a prize of war, she should be compelled to leave port and fall into the hands of the waiting British cruisers. A much more serious problem is presented by Germany's newly announced submarine policy. Claiming that armed merchantmen cannot safely be subjected to the right of visit and search by submarines, the German government has declared that such vessels will, after Mar 1, be treated as warships, and will be sunk without warning. This has reopened the whole question of the *Lusitania* case.

The Russian government, like the French, has swapped horses while crossing the stream. On Feb 3, the Russian Premier Goremykin was succeeded by Stürmer.

**March**

The full significance of events such as the last weeks have seen cannot at once be comprehended. The reviewer can do scarcely more than chronicle the moves in the titanic war game, without seeking to explain their strategy or forecast their results. Thus it avails little at present to speculate why Germany chose to launch her tremendous offensive at Verdun, than which there existed no stronger point in the Allied line. The hope of forcing peace by storming a stronghold the loss of which would most discourage the French, the securing of a vantage-point from which a later French offensive might otherwise be launched,—whether one of these or a dozen other considerations weighed most in the decision will all be revealed in due time.

It is too soon, yet, (Mar 21) to tell what the outcome of the Verdun campaign will be. The assaults started with a drive and a continued pressure that seemed well-nigh irresistible. Fortifications, in themselves, can only hope to delay troops, not defeat them; and no stronghold can be deemed impregnable, if the attacking forces be willing to *pay the price*. German strategy has more than once evinced a willingness to pay the price necessary for a great victory; and the early gains before Verdun, against the very apex of the powerful salient, bore evidence of carefully conceived and well executed plans. In this supreme encounter between the powers of offense and defense, the toll in men and in material has been indeed heavy; small wonder that the intensity of the German assaults has abated. They hold, however, one of the outer cordon of forts; their lines are close and threatening on three sides of the city; and it is at least premature to hail Verdun as the Gettysburg of the war.

Far to the east, another campaign is progressing, hardly less interesting and teeming

with possibilities than that on the western front. The great Russian advance in Armenia has steadily continued, with little opposition from the demoralized Turks. To the north of Erzerum, they have reached Rize, on the Black Sea and only 40 miles east of Trebizond, their next important objective. Farther south, their advance has occupied Bitlis, west of Lake Van, and less than 50 miles from the Tigris. Their campaign in Persia, moreover, progresses favorably, their column having made substantial progress westward from Kermanshah towards Kut-el-Amara, where the situation remains substantially unchanged.

The thirteenth belligerent among the nations at war is Portugal, upon which Germany declared war on March 9. A state of war had virtually existed since February 23, when the Portuguese Government seized all the German ships in Portuguese waters. By this act Portugal multiplied her merchant marine by three, and made available ships which may be used for the transport of British troops. Portugal had been allied to Great Britain, and was under treaty obligations to supply 10,000 troops, if requested. Her army numbers on a peace footing 32,000 men; on a war footing, 183,000. The value of these troops to the Allies, however, is questionable. Following the example of Portugal, Italy has taken over 34 of the 37 German ships in Italian ports.

The German sea raider *Moewe* is reported safely back "in a home port," presumably Wilhelmshafen. She brought in 400 prisoners and \$250,000 in gold; during February she had accounted for 13 of the 50 vessels reported by London as sunk or captured by the Germans. On Mar 1, the announced German submarine policy went into effect, by the terms of which armed merchantmen are to be sunk without warning. However, the party in Germany which favors extreme measures in submarine warfare, seems to be in the minority. Admiral von Tirpitz, the Minister of the Navy, who has been deemed primarily responsible for this severity, has been succeeded by Admiral von Capelle.

The French converted cruiser *Provence* was sunk in the middle of the Mediterranean, Feb 26, by a German submarine. The loss of upward of 3130 lives is the greatest marine disaster known.

**April**

The attention of American followers of the Great War has been somewhat distracted the past month by events in Mexico. The exploits of Uncle Sam's little columns engaged in the punitive expedition, creditable as they are, nevertheless must seem insignificant enough to the European nations locked in such a life and death struggle. Their daily losses continue to be counted in thousands of lives, their daily budget in millions of dollars. The expeditionary force that entered Mexico numbered some seven or eight thousand men, which is approximately the normal daily loss of the Allies. After an unparalleled two months of fighting, the offensive campaign against Verdun—rather a siege than a battle—is still maintained by Germany,

while the rest of the world wonders at the meaning of it all. The element of surprise was eliminated long ago, and the price that Germany has already paid, estimated (by the French) at 200,000 men, seems out of all proportion to the stake. The forts of Verdun themselves have proved an important factor in the contest, only two of them having been reached by the assaulting columns. It is rather the living wall of men, and the deadly "curtain of fire" of the artillery, that have formed a barrier to German progress; and these would continue to maintain their persistent opposition, even were the fortress fallen. Nevertheless German efforts have been concentrated on achieving this objective, and in the course of the march the encircling lines have drawn closer, until it seems that the assailants have at least an even chance of winning. The Germans assert that they have captured 39,000 prisoners, and place the additional French casualties at 150,000. The total territory occupied in their advance is approximately 135 square miles.

Elsewhere on the western battle-front there has been comparative quiet. At St. Eloi, near the city of Ypres, the Canadians who occupy that sector have made themselves conspicuous by their skill in tunnelling and their daring in following up the vantage gained by their mine explosions. The British now occupy about one-fourth of the western front, extending just around the corner of the L-shaped line. Opposite their lines in Flanders the Germans are said to be heavily massed for a new offensive.

Perhaps the most noteworthy report of the Russian operations in the north is that in which the Germans claim to have inflicted on their opponents during the last ten days of March, casualties of 140,000. These figures, exaggerated though they may be at least indicate the severity of the Russian offensive along the Dvina and south of Dvinsk, in which were engaged over half a million men. The renewal of the attacks upon Czernovitz, capital of Bukovina, was also hailed as an attempt to relieve German pressure upon the French lines at Verdun. Although none of these Russian drives has resulted in material gain, it cannot be said that they have had no effect upon the western situation.

In contrast to Russian failure to gain against the Austro-Germans, their rapid headway against the Turks in Armenia has been remarkable. Their second great objective in this region was attained on April 18 in the capture of Trebizond, the most important trading center on the Black Sea. This news came the next day after the Petrograd reports had predicted a long and obstinate resistance. The Russian Black Sea fleet co-operated in the capture of the city. Farther south, toward Erzingan, the Turkish defense is reported to have stiffened, but nowhere has the Russian advance been seriously checked. Besides edging along the Turkish coast toward Constantinople, they have struck south to within 100 miles of the eastern terminus of the completed section of the Bagdad Railroad,

at Nesbin, thus threatening to cut this great thoroughfare of the Turkish Empire. It is quite possible that they will be the first to relieve the British at Kut-el-Amara, although the English columns in Mesopotamia have been making somewhat better progress. No doubt the breaking up of Turkish plans to attack the Suez Canal released strong British forces from Egypt for the Tigris valley.

That German threats of increased submarine activity after March 1 have been fulfilled is evidenced by the long lists of merchant vessels sunk in the English Channel and thereabouts. Noteworthy among these is the case of the *Sussex*, a British steamer which was sunk without warning in mid-channel on March 24, with 380 passengers, about 50 of whom lost their lives. This affair, which was clearly established to have been the deliberate act of a German submarine commander, became the particular cause of a grave crisis in the diplomatic relations between the United States and Germany. More than 2000 merchant vessels of nearly 4,000,000 tonnage have been taken from the seas by the European war, according to figures published by the Department of Commerce at Washington, March 20. Germany, with 600 vessels sunk, captured or detained, heads the list of losers. Two hundred and twenty-five of the 500 British vessels lost were sunk by submarines. Great Britain's allies lost 80 and Turkey 124. The total of neutral losses is put at 736, but most of these were released after being reported captured.

Five successive Zeppelin attacks on the last night of March and first few nights of April marked the continuation of Germany's air campaign against Great Britain. The third of these, in which six airships took part, was the most extensive raid yet made over British territory. Scotland and the eastern part of England were raided, and several hundred bombs were dropped. According to German reports, the docks at Liverpool, as well as furnaces, factories, and ship-building plants were damaged. British reports admit only the killing and wounding of 21 civilians.

For their part, the English made an air attack upon the German airship sheds in Schleswig-Holstein, on March 25. The seaplanes engaged therein were convoyed to their rendezvous by a fleet of light cruisers and destroyers. Three of the seaplanes and one destroyer were lost in the attack, as well as two German scout-boats. The bombs dropped, according to German reports, did no damage.

One of the greatest surprises of the war was revealed on April 20 by the arrival at Marseilles, France, of a flotilla of transports bringing Russian troops to join the French army. A special order was issued by General Joffre welcoming these troops. This affords a striking manifestation of co-operation by the Allies, combining Russian resources in men with French resources in arms and in men with French and British resources in arms and equipment, as well as *leadership*. Moreover, it bids fair to offset, to some ex-

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tent, Germany's advantage of interior lines of communication.

Holland seems to be in the grip of a war scare. Extensive military preparations have been carried out and both troops and railways are said to have been mobilized.

**May**

British prestige in the East received a severe blow when, on Apr 29, General Townshend surrendered his beleaguered army to the Turks. This marks the end of an expedition undertaken (by the Indian authorities, it is said) soon after the war broke out. To attempt to penetrate 400 miles into hostile territory with less than 60,000 troops and no supports on either flank is a hazardous operation, as has been proved. Yet at one time, last November, Bagdad seemed about to be taken by General Townshend's force, then only 18 miles away at Ctesiphon. The battle here, however, though hailed by the *London Times* as a great British victory, proved to be the turning-point of the campaign. In their retreat down the Tigris before superior numbers of Turks, the British were overtaken at Kut-el-Amara, a hundred miles below, and surrounded. The bravery of the defense offset the initial blunder of the fenders, during the siege of 143 days, has to be undertaken. Weakened by disease, handicapped by shortage of men, and constantly beset by the Turks, the garrison hoped in vain for succor from the relieving columns which, only 15 miles below, were trying to hew their way through. The forces surrendered numbered some 3000 British and 6000 Indian troops.

The news of this loss was a disappointment to England, the more keen because it came almost simultaneously with the Irish revolt,—the rebels preaching the doctrine that "England's extremity is Ireland's opportunity."

Verdun continues to puzzle those critics who attempt to explain past moves of the great war, and to prophesy future events. Frank Simonds, writing for the *Review of Reviews* after a visit to the French position, advances the theory that the Germans chose Verdun as the objective of their supreme effort to conquer a peace with France on account of its *weakness*. With the forts discredited and abandoned as defensive positions, the town practically isolated from railroad communication (save for one narrow-gauge road from the south) by German encroachments on the west, and considering the exposed location of the salient, this reputed stronghold was actually, he states, the weakest point in the French line. The retreat from Verdun is believed to have been actually ordered by Joffre, and would have meant, in a military sense, merely the straightening of the French line. But the unwillingness to yield to Germany such an incalculable moral advantage resulted, probably wisely, in reversing this decision. The successful defense of Verdun was made possible, according to Mr. Simonds, by the reconstruction, months before, of the main highway into Verdun on a

magnificent scale, and by General Herr's plans for an intricate and marvelous system of motor transport. This road was the artery through which there flowed to the threatened point a quarter of a million men, with innumerable guns and munitions. The French feel that Germany has done her worst; that for the second time France has taken the full measure of German might, efficiency and power. French spirit has been reinvigorated, not broken. "They shall not pass," is the universal confident assertion.

The English, although they have extended their section of the western front, have shown little aggressiveness during the month. There has been no offensive of a magnitude calculated to interfere with German dispositions at Verdun. In fact, Germany seems bent on maintaining the offensive here, as well as elsewhere and her activities have the earmarks of an exploration in search of a vulnerable point in the English lines.

The long stalemate which characterized operations on the Austro-Italian frontier was broken about the middle of May, when exceptional Austrian activities were reported.

The next few days witnessed important Austrian successes, especially near Rovereto in the Tyrol, including the capture of several thousand prisoners.

In the mountains of Armenia two famous commanders who last year met in the swamps of Poland are again facing each other. The offensive of Grand Duke Nicholas has cleared the Turks from a great semicircular belt, over a hundred miles wide to the south and west of the Caucasus. Within this zone of conquered territory are the two great lakes of Van and Urumia, and such important cities as Trebizond, Erzerum, Mush and Bitlis. But now General von Mackensen, who drove the Russian armies back from the German frontier and then conquered Serbia, has been sent to take command of the Turkish army in Armenia and to check the Russian advance from the Caucasus. So far he seems to be doing it.

The Turkish armies defending Erzerum and Trebizond were not captured with these towns but mostly retreated to the west. It is apparent that the Turks are prepared to defend Erzingan with a large and well organized army. There have been Russian reverses near Mush, but as yet no fair test of the relative strength of the two armies.

Raids upon Great Britain by German aircraft have continued to be frequent. The most extensive, though not the most serious, took place on the night of May 2, when five or six Zeppelins visited the east coast, going as far north as Ratray Head, Scotland. About a hundred bombs were dropped.

The destruction of the British battleship *Russell* by striking a mine in the Mediterranean, with a loss of 124 officers and men, as announced by the British Admiralty on April 28, removes a very valuable ship from service, although she was an old one. The *Russell* was a vessel of 14,000 tons, and carried four 12-inch guns.

An audacious raid was made by a mixed German squadron on the seaside resort of Lowestoft, England, 100 miles northeast of London, and also on Yarmouth, under cover of darkness about 4 a. m. Apr 25. The official announcement from the British Admiralty states that the enemy ships consisted of a cruiser squadron, accompanied by light cruisers and destroyers. The local naval forces engaged it, and in about 20 minutes it headed for Germany. The damage, according to English reports, was slight.

The German naval report for April states that 96 Allied merchantmen of 225,000 tonnage were sunk.

*May 20-June 20*

The most unsatisfactory part about beating the Russians is that it does not *last*. This is being demonstrated strikingly on the Eastern front by General Brussiloff's brilliant campaign. The Austrians, so recently the victorious assailants on the Trentino frontier, suddenly find themselves the hard-pressed defenders of their shattered lines in Volhynia and in Bukovina. No doubt the need of men for their offensive had denuded the trenches facing the Russians. In the strength of these trenches, the Austrians placed great confidence. At any rate, they offered scant resistance to Brussiloff's rapid advance, which proved that trench lines can be broken under favorable circumstances. The Russians, apparently discarding the tactics of the western theater, the familiar attack upon a narrow front after long artillery preparation, swept forward over a zone more than 200 miles wide. With Lutsk and Dubno taken and the Volhynian triangle thus regained, with Czernovitz at last captured, with Kovel threatened and Lemberg in no little danger, the Russians can claim the greatest victory since trench warfare fairly started after the Battle of the Dunajec. Whether their further advance can be stayed, with the help of German forces, remains to be seen. German counter-attacks have already been made, notably north of Lutsk and southwest of Dubno, but without decisive results. At any rate, the capture of the 170,000 prisoners claimed by the Russians is in itself a notable achievement, and a loss that the Teutonic allies can ill afford.

Observers are asking if this Russian offensive can be the first step in the "Big Push" that has been expected so long. The Austro-Germans must be outnumbered now at nearly all points. They have weakened themselves on one front in order to deliver blows on two other fronts. Both blows have now apparently been parried, without disastrous results. By holding Verdun for four months under terrific attack, the French have prevented a great moral victory for Germany; even though the ruined city ultimately fall to the Germans, the event would have lost much of its significance. England has declared that she will attack when Joffre says the word; and surely it is for England and Russia to bear the brunt of the summer campaign,—France has done her part. It is interesting in this connection to note the statement, for

which Mr. Frank Simonds is responsible, that when the Verdun offensive began, the British *did* offer to counter-attack. But Joffre asked Haig instead to take over the Arras sector of the French front, thus releasing a whole French army to reinforce Verdun. In all events, it is evident that there is an increasing degree of co-operation between the Entente Allies; France is said to have been dissatisfied with England's achievements, but not with her efforts.

The fourth month at Verdun found the Germans attacking, alternately on both sides of the Meuse, with undiminished vigor. The chief gain of the month was the final capture of Fort Vaux, after a prolonged and gallant resistance. This widens the breach that has been made in the girdle of forts, but leaves other strongholds that separate the Germans from their objective, notably Fort Tavannes, south of Fort Vaux, and Fort Souville, which is 50 meters higher than Fort Vaux and directly between it and Verdun.

Italy has benefited materially from the Russian offensive. The Austrian attacks in northern Vicenza have lost most of their driving power, and the Italians have had time to form a strong defensive position along the Posina-Arsiero-Asiago line. However, the failure to stop the Austrian attack at the frontier had already caused the downfall of the Cabinet and the recall of several generals, notably General Brusati, formerly the Italian commander-in-chief in the Trentino.

Little news of importance comes from the Balkans. The Allies appear to have been shifting their forces, which now include the rejuvenated Serb army, north toward the border. There have also been reported movements among the Bulgarians, who now comprise most of the troops on the other side of the border, and who have occupied the Greek Fort Rupel, near Demir-Hissar. The Greek army has been demobilized under strong pressure from the Allies, who practically exercise a military dictatorship over this unfortunate nation.

In Asia Minor, the Turks are reported to be strongly reinforced, and they have not only checked the Russian advance, but have delivered sharp counter-strokes. Mamakhatum, taken by the Russians a month ago, has been recaptured by their Mohammedan foes. Reports from the Mesopotamian region are meagre, but Russia's progress toward her goal in that region also appears very slow. Near Khanikin, on the route through the mountains from Persia, there has been indecisive fighting, while the Russian column headed toward Mosul, on the site of ancient Nineveh, has been attacked by the Turks at Serbecht.

Turning to the operations on water, we find this month marked by the first great conflict between modern fleets. The Battle of Skagerrak was fought beginning the afternoon of May 31, and lasting through the night, off the Danish coast near the northern extremity of Denmark. Two cruiser squadrons first engaged each other, both of which were rein-

**EUROPEAN WAR—Continued**

forced, the Germans first, while the main English superdreadnought fleet under Admiral Jellicoe did not arrive until dusk, too late to take an active part. The Germans, warned by their Zeppelins of the approach of the enemy's main fleet, retired under cover of the night to their base at Heligoland. The British admitted the loss of three battle-cruisers and eleven other craft, a total tonnage of 114,000 tons. The Germans at first reported only one battleship as lost, with nine smaller vessels, a total of 32,500 tons. The English, however, claimed the total German loss to be 111,000 tons, and later German reports admitted losses additional to those first reported.

From the conflicting reports of the victory claimed by both sides, it is clear that the Germans, with superior aerial reconnaissance, were able to take advantage of their temporary superiority in ships, and to strike quickly and hard; that Admiral Beatty, bravely giving battle to the stronger German fleet with his battle-cruisers, received a severe punishment; and that the German High Sea Fleet was unwilling to dispute the supremacy of the English Grand Fleet, when the latter finally came up. Despite the exuberant claims of German victory, English command of the sea has not been shaken.

Admiral Goodrich, discussing the lessons of this greatest of naval battles, thinks the English battle-cruisers were over-confident. He says: "... that it would have been more prudent to let them draw the German battle-ships to within range of the British battle-ships fast coming up to their relief." And again, commenting on the evidence furnished by the battle as to the relative strength of battleship and battle cruiser, "it is likely to strengthen the belief, general among naval officers, that the battleship remains, as before, the arbiter of fights on the sea."

Kitchener is dead. The cruiser *Hampshire*, which was carrying England's war chief to Russia for a conference at Petrograd, went down on June 5 off the west coast of the Orkney Islands. It is not known whether the disaster was caused by a British mine, wrenched loose from its moorings, or by a German submarine, apprised of Lord Kitchener's secret mission. No news of the war has been a greater shock to the British public. He it was who had seen most clearly the problem confronting England when the war broke out, and had been mainly responsible for raising the greatest volunteer army the world has seen. He had been criticized, and perhaps justly, for failing to see that the armies in Flanders were provided with the right kind and necessary amount of ammunition. But there was no one in whose energy and ability so much confidence was felt. Fortunately for England, his work was about done, and his policies can be carried on by men left behind.

Meat reduced to half a pound a week, potatoes to a pound a day, not enough milk for babies, the beer supply running short, etc.,

etc. Thus the reports from Berlin; the Germans do not deny their shortages, but proclaim their ability to put up with deprivations, and to endure hardship. That the situation is serious is shown by the extraordinary measures taken to relieve it. A Department of Food Supplies has been created, the chief of which, Herr von Batocki, is a food dictator with practically unlimited power over all matters of food except in the army.

June 20-July 20

"The Battle of Europe" is the significant term that has been applied to the conflict now raging in the several different theaters of central Europe. The last month has seen initiated a campaign which may prove to be the culmination of the war. For the first time the Allies are striking in unison—east, south, and west; Germany, without relinquishing her persistent offensive on the Meuse, finds herself thrown on the defensive at the two ends of her far-extended line. "Kitchener's army," at last fully equipped and ready, has undertaken a task which will test to the limit its quality and temper. Whether the attack launched by the Anglo-French in Picardy win through to a substantial success, or whether it find the successive German lines too strongly held to be routed—in either event, the contestants are likely to be left in a mood which will make possible the discussion of terms of peace.

The attack for which England and France had been preparing so long was launched on the morning of July 1 at 6:30 a. m., after a preliminary artillery preparation as thorough and searching as anything the Germans have been called upon to face. In contrast to the earlier attacks upon a narrow front, this advance was made over a belt twenty miles wide, on both sides of the River Somme, which formed the approximate boundary between the English and French sectors of the line. The artillery bombardment had done its work so well that the first advance was made with little difficulty. At the end of a week the French had progressed some four miles, and occupied Biaches, only two miles west of Péronne, the immediate objective on this front. The British had been less successful to the north, perhaps because here the Germans made a stiffer resistance; after another week of severe fighting, however, they were fairly abreast of their French neighbors. The number of prisoners taken the first week, 8000 by the French, 6000 by the English, hardly compares favorably with the drive last fall in the Champagne, and is not at all comparable with Russian successes in the east. Altogether, the Allied drive has so far achieved no remarkable results, and is significant only if viewed as the beginning of a campaign that must be pushed as relentlessly as Grant's advance toward Richmond in 1864.

After seven weeks, the great Russian offensive, while it has slowed down, has not yet halted. Progress toward Kovel has been slow, and Lemberg has not yet been seriously threatened. But the Russian advance has continued unchecked through Bukovina, cap-



turing Kolomea, and completely demoralizing Austrian resistance in that region. Some 15,000 square miles of territory have been occupied; but more significant than that are the Teutonic losses in man-power. Russian official dispatches claim the capture of about 300,000 Austrian and German prisoners—a claim vigorously denied, it is true, by their adversaries. On the basis of Russian figures, which have hitherto been reliable, one must conclude that the total loss to the Teutonic allies is not far from half a million men. Though the Russians may fail to compel a general retirement of the enemy from the Gulf of Riga to Rumania—and their ultimate objective is nothing less than that—this great impairment of their enemy's strength is a blow that cannot but cripple the central powers.

A noteworthy event on both Eastern and Western fronts has been the conspicuous appearance of the cavalry. On the more broken terrain in the east, opportunities have not been wanting before this for the Cossacks to maneuver; but the trench warfare of the Western front was thought to have eliminated cavalry tactics, until two troops of British dragoons made a charge near Pozières that has attracted considerable notice. Riding out through the pathway the guns had made for them, beyond the demolished first and second-line trenches, they charged the Germans, who were endeavoring to form a new defense line further back. Despite the fire from the automatic rifles of the surprised infantrymen, the dragoons, according to an eye-witness, rode through their opponents, then wheeled and swept back.

The Italians, with a new ministry in power, and General Cadorna at the head of the Alpine army, have gone far toward making good the losses inflicted by the Austrians a month ago.

Greece, helpless in the face of the partial blockade which the Allies established, gave way to their demands, has demobilized her army, and will hold new elections in August.

Conditions in the more remote theaters have not changed materially. Russia is credited with some progress in Asia Minor, while Turkish difficulties have been further complicated by a revolt of the Arab chiefs near Mecca against Turkish control. The net drawn by British, Belgian, and Portuguese troops about German East Africa is steadily tightening; the vast extent of that colony and the character of the terrain make the task a slow one.

German ingenuity and enterprise scored again, most signally, when the submarine *Deutschland* on July 9 appeared in the harbor of Baltimore, with a cargo of about 1000 tons of aniline dyes, medicines, and mail. The vessel was thoroughly searched by United States officials, who pronounced her unmistakably a merchantman; she is of a new type in submarine construction, 300 feet long, and carries no torpedo tubes nor guns. Captain Paul Koenig, who commanded this pioneer craft, apparently had no difficulty in eluding the hostile vessels encountered, by the simple

process of diving. The German press jubilantly hailed the event as marking a new era in the history of navigation; the English, while admitting the cleverness of the feat, pointed to the comparatively small cargo capacity.

The economic conference at Paris in June, at which eight of the Allied Powers were represented, is likely to have a far-reaching influence. It was decided to establish a complete boycott of enemy countries during the war. No merchandise coming from an enemy country is to be imported; and exports to neutral countries are to be prevented from reaching enemy countries. Measures are contemplated after the war aiming to prevent Germany from regaining her commercial supremacy in any territory controlled by the Allies. Finally, the Allies are recommended to take vigorous measures to make themselves completely independent of the enemy countries, as regards raw materials and manufactures. Truly, these are deadlier weapons than bullets.

The last vestige of authority attributed to the Declaration of London was destroyed when the British and French governments announced that they would no longer pay any regard to this code. One provision after another has been renounced by the British Orders in Council, which have now declared all commerce with Germany contraband, and which claim the rights of a blockade, although England exercises no control over the Baltic coast of Germany.

July 20-Aug 20

The end of July marked the close of the second-year of a world war, which it was freely prophesied at the beginning was to last hardly more than two months. The second year had seen the culmination of four major campaigns (not to include events of no little importance in the Far East); the German advance deep into Russia, the Anglo-French attempts to pierce the German line at Loos and Champagne, the signally successful Austro-German drive through Serbia, and the attack upon Verdun that developed into the greatest battle the world had known. Thrice did Germany strike, with vast achievement, though qualified success. Once, standing on the defensive, she proved invincible. Yet the end of the year brought no lasting reward to the Central Powers, no signs of the victorious peace they talked of. Instead, they found themselves surrounded by a circle of steel,—a France nerved and inspired to miraculous efforts, a dogged and unbeaten England, a Russia inexhaustible in men and resources, an Italy stung into frenzy to redeem her shaken prestige—these enemies, taught how to fight by Germany herself, now for the first time learning how to unite and make effective their joint strength.

West and east, on August 1, the Austro-Germans stood on the defensive. Before the end of the month two new campaigns were launched by the Allies. The first of these was rather the continuation of a previous offensive. Ever since the armies of General Cadorna had

**EUROPEAN WAR—Continued**

started their advance against Trieste a year earlier, the main obstacle to their progress lay in the fortified city of Gorizia, on the Isonzo. At least four distinct attacks upon this stronghold had failed, the most desperate attempts to take it having been made early in the winter. This fifth effort the Italians had planned to make three months ago, but they had been forestalled by the Austrian offensive in the Trentino. Now at last they were ready, and after a brief campaign which was marked by skillful engineering and dashing execution, they captured the long-contested bridge-head, and soon afterwards entered the city. (Aug 9.)

The other offensive has barely started as this period ends. All the summer, the Balkans have been watched with increasing expectancy for signs of an allied offensive there. At last it has been initiated. The Allies are about to attempt to fulfill their promise to Serbia of ultimate deliverance, and the troops of six nations—Russian, Italian, Serbian and Montenegrin forces having joined the original Anglo-French army—are in motion northward over a wide front. Mr. Frank Simonds is authority for the statement that Kitchener opposed the transfer of British troops to Saloniki, but that Joffre overruled him in a memorable interview, and since that time General Sarraïl's army has been gradually augmented, until it is now estimated at 700,000 strong.

Facing this force is the main part of the Bulgarian army, strengthened by German, Turkish, and a few Austrian troops. In this campaign of ten nations, the Allies are not to monopolize the offensive, however. Almost simultaneously with their advance north from Saloniki, comes the news of Bulgarian successes far out on both flanks, where the Bulgars, though not at war with Greece—are advancing into Greek territory and seizing points which may be of political, if not military, advantage to them later. If the estimates of the strength of the Central Powers on this front,—some 400,000—is at all correct, these movements cannot constitute a serious offensive. They may result, however, in spurring Greece to throw in her lot definitely with the Allies; in any event, her status could hardly be worse than as a neutral. Rumania, too, seems to be leaning toward the Allies with somewhat increasing assurance of definite action in the near future.

On the eastern front, the Russian offensive has been continued, with further important gains at some points, particularly in Galicia. Austrian resistance has been better organized since the command of the entire eastern front was entrusted to von Hindenburg; the mere announcement of this change seemed to stiffen the crumpling lines. But the Russians have shown an ability to shift their point of attack that has disconcerted their enemy, and concentrating successively on different sectors they have made substantial advances. The barrier that the Stokhod River interposed in front of Kovel has been substantially over-

come; the capture of Brody marks a distinct advance toward Lemberg, along the line from Dubno; and farther south, the threatening Russian wave has swept over and past Stanislaw, well toward Halicz. True, the drive undertaken at the extreme north near Riga, and heralded as a repetition of Brussiloff's success, accomplished practically nothing, and soon died out. General Kuropatkin's transfer to the command of the province of Turkestan seems to imply criticism of his failure here.

Austria, driven back on two fronts, has displayed unmistakable signs of weakness. It would seem that her troops can fight effectively only when energized and driven by German high command. Nor has Germany's ally in the far east proved other than a broken reed on which to lean. Although the Turks were able to retake Mush and Bitlis from the Russians, it was at the cost of losing the important city of Erzincan, on the main route of Russia's westward advance. Armenia bids fair to be forever rid of her oppressive rulers. The belated advance against the Suez Canal met with a severe check; any effort in that direction is likely to find the British well prepared.

In spite of the brilliancy of these campaigns in the east and south, and the far-reaching effect the new campaign in the Balkans may have on German hopes of a colonial empire in the Mediterranean, the chief interest returns to, and centers in, the mighty conflict on the Somme. Only here on the western front (and perhaps in the Balkans) are Germany and England grappling hand to hand, and one feels that the war is now most essentially a supreme struggle for leadership between these two. Here the main decision must be reached. On the Somme, the issue is still undecided. West of Péronne, the lines are little changed from a month ago; north of the river, the British and French have pushed, and blasted, and hewed their way in all some six miles, or about half-way to Bapaume. Like the attack on Verdun, the Anglo-French offensive is in the nature of a push, driven home with an unyielding pressure. Often the assaults are reported to have penetrated the third line, but never have they failed to find another line beyond. Every fresh advance is disputed by desperate counter attacks, and this many a stronghold has been occupied time after time before being finally secured. As yet, the Allies have shown no inclination to stop pushing.

Few were the Americans who, whatever their sympathies abroad, did not wish "God-speed" to the little *Deutschland* when she put out from Baltimore harbor early in August. Her safe return to Bremen was heralded in Germany as a moral triumph, tho in no sense as a neutralization of the British blockade.

There are some indications that Germany will endeavor by means of her improved Zeppelins to duplicate in the air her sub-aqueous feat. The latest type of airship is reported to be 840 feet long, with a cruising radius of 3000 miles, and a carrying capacity of five tons

of high explosives. Four raids were made on the English coast by Zeppelins in a single week, a fact which gave some color to the report that the Germans were trying out the English anti-aircraft defense and otherwise preparing for a huge airship over-sea attack.

Mr. Simonds sums up the present military situation as follows:

"Every outward evidence that a reasonable man can accept points to another year of war to the fulfillment of Kitchener's forecast of a three-year war. Nothing is yet decided save that Germany has failed to crush France or Russia and to compel Britain to ask peace by menaces directed on land at Egypt and India and on water at the sea-borne trade of Britain by the submarine. Possessing Belgium, thousands of square miles of northern France, all of Poland, most of the Baltic provinces and much of Volhynia, the central powers still have a tremendous booty, which is not yet counterbalanced by Germany's lost colonies and vanished sea trade.

Finally, holding Serbia and having enlisted Bulgaria and Turkey, Germany possesses the keys to that "place in the sun" for which her statesmen have long yearned, and no man can believe that she will surrender them and forsake her allies until she has suffered defeats which are not yet to be forecast. Until the gateway to the near east is bolted at the Danube again, talk of peace is futile short of that hour when exhaustion comes, and that is still far away. It is more war, not peace, that the year-end promises—this is unmistakable."

*Aug. 20-Sept. 20*

In the Balkans there was lighted, some two or three years ago, the flame of controversy that was soon to envelop all Europe. There are not lacking critics who look for developments of the most decisive importance in this same theater. Here is situated the gate that opens or closes to Germany, the pathway to her coveted Oriental empire. The route to Constantinople, so recently won, is now flanked on both sides by dangerous enemies. With this line once cut, and the Straits freed to the commerce of the Allies, the Central empires would be seriously crippled.

Thus the entrance of Rumania into the conflict is an event of moment. With a population of 7,500,000, this new Allied nation can put into the field armies numbering 700,000 or more. The man chiefly responsible for Rumania's action is Take Ionescu, ex-premier of Rumania, who wields an influence comparable to that of Venizelos in Greece. It was only after the recent Austrian reverses in Bukovina, however, that Rumania ventured to declare war against the neighboring Teutonic state. In the note conveying her declaration of war to Austria-Hungary (Aug 29), she frankly avows her object in taking up arms.

"Rumania, from a desire to hasten the end of the conflict and to safeguard her racial interests, sees herself forced to enter into line by the side of those who are able to assure her realization of her national unity."

To Rumania this "realization" means chiefly the acquisition of Transylvania of whose two and a half million inhabitants she claims three-fifths as of her own race.

For this action on the part of Rumania, Germany was well prepared. Indeed, the first reports of the impending decision came through German sources. One of her ablest generals, von Mackensen, had been sent to Bulgaria to take command of a Turko-Bulgar-German army in this theater. When the Rumanian forces poured over the frontier into Transylvania and Serbia, her southern boundary was left thinly protected. The German strategy was to thrust quickly up into the Dobrudja, the section of Rumania south of the Danube and bordering on the Black Sea, thus anticipating any advance of the Russians south toward Varna. This movement was carried out effectively by von Mackensen, who captured several Rumanian cities with little resistance, and advanced so as to threaten the single railroad line from Bucharest through Cernavoda to Constanza on the Black Sea.

It was the Bulgars who precipitated the present conflict along the irregular 150-mile front in the Salonika region. For some unexplained reason, the Allied force under General Sarrail, though far superior in numbers to its opponents, has been slow in moving, and the Bulgars, by their advances on both flanks, have obtained positions of strategic value. Thus their possession of the Rupel pass through the mountains in the north of Greece, and of the railroad eastward through Seres and Drama constitutes a serious menace to any Allied movement north along the Vardar, while the gains made in the vicinity of Monastir and Florina in the west are being won back by the Serbs only after severe fighting. Meanwhile, the political situation of Greece has become more chaotic than ever. The invasion by the Bulgars and the seizure of Kavala and its Greek garrison, have helped to bring matters to a climax. Greek soldiers are reported to have joined the Allies in large numbers. The attitude of the latest cabinet, formed by Nikolas Kalogeropoulos, is not yet clearly apparent, but the influence of Venizelos in favor of the Allies is in the ascendant.

The Russian campaign along the eastern frontier has made little progress. A promising movement against Halicz was severely checked on Sept 18 by German counter-attacks which resulted in the capture of 4000 Russians. Some assaults were made in the Carpathians with rather better success. The comparative inactivity of the Russians on this front is perhaps explained by their need of readjustment to the altered conditions. With Rumania's entry into the war, a path to Constantinople is now open, far shorter and more direct than the route west through the Asia Minor. It will not be surprising if Russian efforts elsewhere diminish in intensity.

On the Somme, the Allies have extended their gains materially, and both French and

## EUROPEAN WAR—Continued

English have earned tributes for their fighting ability.

France having astonished the world by unsuspected qualities in a long defensive campaign, now demonstrates anew the superb quality of the French soldier when attacking.

Thus the *Army and Navy Journal* and again:

"The winning of these few miles in Picardy has been the most costly success in all British history, but has thoroughly re-established the race in the front ranks of those who fight and fight well."

A striking and picturesque feature of the recent British attacks has been the employment of a novel type of armed motor car on the battlefield. These "tanks," or "Willies," as they have been dubbed, are provided with extended caterpillar treads, and are reported to perform incredible feats, advancing unscathed over trenches, obstacles and shell-holes. The picture is suggested of future battles, in which huge fleets of land-ships may play an important part.

Altogether, the effect of the Battle of the Somme has been to discredit the belief that the Central Powers can hold their present lines indefinitely. Analyzing the available figures as to the number of combatants and losses, Mr. Frank Simonds finds evidence for believing that Germany will shorten her lines in the west. "To-day," he continues, "the real problem is not the change in front on the west, but the capacity of Austria to endure another year of the war. It is against Austria that the main blows are being directed, and the western campaign has for its prime objective keeping Germany occupied on this front and preventing the dispatch of German troops to Hungary, Galicia or Bulgaria. The actual occupation of territory is, beside this, purpose, unimportant."

The English find no little satisfaction in the destruction of a Zeppelin on Sept 2, one of a squadron of 13 that were making a night raid across the Channel. The dirigible was sighted on the outskirts of London by Lieut. Robinson, of the Royal Flying Corps, attacked by him at an altitude of 10,000 feet and set on fire, falling a mass of wreckage.

The British light cruisers, the *Nottingham* and the *Falmouth*, were sunk in the North Sea (Aug 19) by German submarines while searching for the German High Seas Fleet. The *Nottingham* was a vessel of 5400 tons, with a crew of 380 men; the *Falmouth* slightly smaller.

On Aug 28, Field-Marshal von Hindenburg assumed the chief command of all the German forces. Falkenhayn's removal as chief of staff is the penalty, it is rumored, for the failure to take Verdun.

On Aug 27 Italy declared war on Germany.

When the latest belligerent joined the contesting powers of Europe, all eyes were turned to watch the result of this new development upon the alignment of the opposing powers. It was a great moral victory for the Allies

that Rumania should have deemed the time ripe, the outlook for success sufficiently secure, for her to take up arms against the redoubtable Germans. But what military significance would the entry of her not inconsiderable forces into the conflict have?

Political considerations seemed uppermost in the first movements the Rumanians made, striking as they did across the mountains into the coveted fields of Transylvania, the occupation of which could have little effect upon the main decision of the war. The fleeing Hungarian refugees added one more problem to the difficulties which Germany was called upon to face. And brave was Germany's response to the test imposed by the urgent calls for help from her allies. We have seen last month how one of her foremost field generals, von Mackensen, had been preparing for his brilliant stroke in the Dobrudja, which, by threatening the southern gateway to Rumania's capital, confounded the latter's plans for an offensive on her opposite frontier. And this was not all. The Rumanian columns that penetrated into Hungary, be it remembered, had won some promising initial successes in the capture of several cities not far from the frontier. In the meantime, the command of the Teutonic forces in this theater was assigned to von Falkenhayn, late German chief of staff, and a general of undoubted ability. Soon the Rumanian armies of occupation, brought to a halt partly on account of threatening developments in the Dobrudja, found not only that they were being assailed in front, but that the passes behind them had been occupied by their skilfully maneuvering opponents. It was with difficulty that the Rumanian troops made their way back across the frontier, and the record of this retreat with its losses in prisoners and material, is not a particularly creditable one to the Rumanians. It was at this time that King Ferdinand, evidently frightened at these unexpected reverses, sent out through the *London Times* his piteous appeal to the Allies "not to allow the affairs of Rumania, who staked all in entering this conflict, to pass into the back of their minds and suffer her to meet the fate of Belgium and Serbia." Subsequent developments have given some color to Ferdinand's alarm, although they have not borne out his worst fears. With Russia's assistance, Rumania has been able to check the advance of the Teutons on both fronts; as the period closes, however, Mackensen is credited with fresh successes.

After a considerable lull in the Isonzo sector, Italy has reinitiated her drive toward Trieste with fresh energy. This effort, which was scheduled for the first of November, is reported to have been hastened on account of the discomfiture of the Rumanians. Italian progress in the face of the formidable defenses of the Carso Plateau does not seem impressive.

Little connection can be traced between the military activities in Rumania and those further south about Saloniki, where the campaign of the Allies is progressing very leisurely. Reports of these operations come from three distinct sectors—those about Struma,

Doiran, and Monastir. Of these, the chief activity has been manifested in the west, where the Serbs, having crossed the great bend of the Cerna River, are making headway against their own city of Monastir. Meanwhile, Greece still delays any decisive action. Torn by dissensions and rebellions, her navy and functions of government taken over by the Allies, her plight is more deplorable than ever. With her army deteriorated, her chance of making favorable terms with the Entente thrown away, the question of her allegiance has become a side-issue.

From Russia have come evidences of sporadic attempts to renew the push toward Lemberg, to which Halicz still effectually blocks the way. Some small local gains have been made in the Carpathians; a successful crossing of this barrier would put the Russians in a position to co-operate with the Rumanians against the Teutonic left flank in Transylvania.

The Battle of the Somme has passed into its fourth month, without any signs of approaching a decision. The capture of Thiepval and Combes has marked the chief Allied gains for the month; thereafter, German counter-attacks became particularly violent, and no further considerable advances were made. After all, territorial gain or loss on such a scale is not very significant; it has been calculated that the sum total of the Allies' achievements in this respect has been to win back 3 per cent. of the territory overrun by their enemy. It is rather a test of endurance, which will be won by the side that can take the longest and severest punishment.

Zeppelins have been particularly active in raiding English soil during this period. The damage done by these air-ships, according to the British reports, is inconsiderable; but there seems to be credible evidence that the raids have been much more destructive, both of lives and munition plants, than has been admitted. The Germans have paid with the loss of four Zeppelins, whose monstrous frames lie a mass of tangled wreckage in English fields.

#### Oct

American citizens felt that the war was coming near home when, on Oct 8, the German submarine *U-53* sank off the New England coast four British steamers, one Norwegian and one Dutch freighter. No lives were lost, and no evidence obtained that Germany had violated her pledges made to the United States regarding submarine warfare. The *U-53* had put in at Newport for a few hours previous to the raid.

In an article on the losses to date due to the great war, Mr. Frank Simonds estimates the total casualty lists of the six Great Powers as follows:

France .....	2,500,000
Russia .....	5,750,000
Great Britain .....	1,400,000
Italy .....	350,000
Total—Allies .....	10,000,000
Germany .....	4,000,000
Austria .....	4,000,000
Total—Central Powers..	8,000,000

Placing the permanent loss at one-half the temporary loss, it would follow that the Central Powers had sacrificed about one-third their total man-power, the Allies only one-sixth of theirs. Mr. Simonds judges that the war is likely to last two years more, but that the Allies' policy of attrition is calculated to result in the final discomfiture of the numerically weaker force.

The third autumn of the war is fast drawing to an end. With winter close at hand, there is small likelihood of any new offensive on a large scale. The season of 1916 begins to be seen as a whole; and despite recent developments in the Balkans, it must be recognized that the advantage has inclined toward the Allies. When Germany launched her legions against Verdun, it was with the hope of decisive victory; with Russia out of it, as she believed, for many months, France was to be crushed and a victorious peace might be won. But the campaign thus initiated was a costly failure,—a failure emphasized on Oct 23, eight months after its opening, by the French *coup* which won back Donaumont and other dearly-bought German gains. The Austrian campaign against Italy similarly collapsed; Russia, England and France, and Italy successively assumed the offensive, until in mid-summer the Central Powers were battling on the defensive on every front. Only when Rumania, judging unwisely that the issue of the war was decided, "rushed to the succor of the victors," was Germany able to assume the offensive once more in this new theater. This she did in brilliant fashion, and the news of victories in the Dobrudja and Transylvania gave fresh heart to the Central Powers. To be sure, the new campaign resulted in a lengthening of their battle lines; it called for fresh troops, and perhaps prevented Germany from carrying out another offensive, presumably against Russia. Yet the importance of German achievement here in the Balkans should not be underestimated. What appeared to be a dangerous threat was utilized as a stepping-stone to victory. The road to the East has been made the more secure. A considerable section of Rumanian territory has already been overrun, and the wheat and oil lands of Rumania are a prize worth striving for to the Central Powers. With armies on all sides of the little kingdom, Germany is in a position where further signal successes might well nigh snuff out Rumania, materially shorten her own lines, and present a new menace toward Russia.

More and more, therefore, the Balkans are becoming the theater of predominant interest. Here Germany has won the prize she coveted, the route to the East. Her grip on it is a secure one, one that the Allies cannot easily loosen. East as well as west, the Central Powers have all the advantage in position, in territory occupied. Their task is to hold secure what they have, to stand successfully on the defensive against the superior man-power of their enemies. It is much too early to draw any conclusions; indications point to

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a lengthened war, and the "campaign of 1918" is freely discussed already.

Nov

The Macedonian front assumed a new importance with the capture of Monastir on Nov 19. The Allied army in this region, composed mostly of French and Serbs, had been making headway slowly along the Cerna River, flanking the Bulgars out of one position after another, until finally Monastir was rendered untenable, and was abandoned by its Bulgar-German garrison. This success, restoring as it does to the Serbians a corner of their native soil, is particularly welcome. Its relation to the general situation is not yet clear. Possibly it may have been considered a necessary preliminary, clearing the flank for General Sarrail's advance north along the Vardar. It has been a mystery why the latter's main attack has delayed so long, although there have been rumors of failure in the British transport service. At any rate, developments in this theater can hardly be in time to relieve the pressure on the Rumanians to the north.

The pounding on the Somme continues, with little change in the situation. The British have gained ground in a new sector of the battlefield, having advanced from Thiepval some miles up the valley of Ancre Brook. Weather conditions have to no little extent interfered with operations. German counter-attacks have been particularly violent, and have regained some lost territory.

The Italian attempt to reach Trieste was renewed on Nov 1. The effort proved more fruitful in prisoners captured than in actual distance covered. Their goal, some 15 miles away, is not appreciably nearer. The campaign is thought to have had some effect in relieving the pressure upon Rumania.

"One of the surprises of the war," remarks the *Independent*, "has been the success of the British in keeping in constant communication with the Continent. Millions of troops have been transported back and forth across the English Channel without loss. The Germans secured a sea base close by when they took the Belgian Port of Zeebrugge, but the Channel has been so well protected by patrol boats, mines and, it is said, great steel nets, that the Germans have rarely attempted and never succeeded in interrupting the trans-channel traffic.

"Now, however, it seems that the Germans are entering upon a more aggressive policy. On the night of the 25th a flotilla of ten torpedo boats from Zeebrugge made a raid on the Channel and sank one transport, the *Queen*, which by good luck was not carrying passengers. The crew was saved. One of the British destroyers, the *Flirt*, was lost and another, the *Nubian*, disabled and grounded. A number of small outpost and guard were also sunk. The German report says that all their torpedo boats returned safely. The British claim that two of them were sunk."

German U-boats have been again in the

foreground. A vigorous campaign has been waged against Norwegian shipping, in return for Norway's refusal to recognize commercial submarines as merchantmen, as the United States has done. The U-boats range up the Norway coast into the Arctic Ocean; the port of Christiania is virtually closed, and the route to Archangel commanded in such a way as to seriously interfere with the importation of munitions into Russia.

The case of the *Marina* has reopened the submarine controversy between Germany and the United States. This British steamship was reported to have been sunk without warning by a torpedo while proceeding from Glasgow to Baltimore (Oct 30). Of the fifty Americans on board, members of the crew, six were drowned. The *Marina* carried a 4.7 inch gun, which she had made no effort to use. In the *Sussex* note, Germany promised not to sink passenger and freight vessels "unless the ships attempt to escape or offer resistance."

At the beginning of the war, the Czar announced that Poland would be granted autonomy, provided the Poles remained loyal. Now (Nov 5) the Kaiser and the Austrian Emperor promise that Russian Poland (not their own Polish territory) will after the war form an independent state. As a recruit, the Pole is much in demand by the warring powers; but as a patriot, he will probably put little faith in the promises of the kings of the three nations that divided up his country. He still looks for a reunited national Poland,—and it seems not improbable that such a state may be born again from the ashes of the war.

## THE WESTERN THEATER

On the French front there have been frequent rumors during the month of a new German offensive,—an offensive which has not materialized. For this purpose, strong forces of infantry and artillery were supposed to be concentrating behind the Artois and Flanders positions, or (later in the month) in Alsace. For this reason, moreover, the air squadrons of the Allies were particularly active in reconnaissance, and in air raids upon reserve depots in rear of the German lines.

German advances, however, have been confined to the minor affairs customary for several months. In the Champagne region, between Souain and Tahure, their assaults have continued to be so successful as to offset to a considerable extent the hard-won gains of the French in September. These advances are met by vigorous counter-attacks. A trench 500 yards long, captured from the French in this region, has been the target for hand-grenade attacks and a vigorous pounding by the French artillery. These prolonged counter-attacks, while they have failed to dislodge the Germans, have prevented their securing a firm foothold.

"On the entire western front there has been a decided increase in the activities of the underground fighters. Mining and counter-mining is being resorted to, and when a mine is exploded by one side, the enemy frequently

replies by firing another in the same region. These operations are of constant occurrence in the sector north of Arras. Near Givenchy the British sprung two mines, and while the craters were being consolidated the enemy sprung a mine which buried ten British soldiers. Again, the explosion of a British mine east of Bois François was answered by a German mine in the same neighborhood."

In the Vosges, after two weeks of inactivity due to a severe snow-storm, Hartmansweilerkopf became once more a spirited battle-field. The crest was taken by the French, with 1200 prisoners. To this capture were added later more trenches and 500 additional prisoners. The Germans, however, claim to have recaptured the summit and 1500 men, by a later counter-attack.

There is little noteworthy in further detailed reports of operations on this front. Occasional bombardments in the Belgian, Artois, and St. Mihiel sectors, unusually active mining operations in the Argonne, everywhere grenade fighting and surprise attacks. The month ended with brisk gun-fire over a large part of the entire front, and both sides prepared to repel expected attacks.

"The extent and importance of the aerial service on the western front is indicated by the report of an effort by German airmen to stop the allied reconnaissance back of their lines. This led to no less than forty-four combats in the air in one day, and cost each side several machines and a number of men. German reports tell of another victory in the air by Lieutenant Immelmann, who caused an English monoplane to fall over Valenciennes after an aerial battle. This is the seventh victim of this German airman."

The French claim to have established a marked superiority in this aerial conflict.

#### Jan

Along the coast, the German positions at Westende have been several times bombarded by British monitors. In Belgium, artillery fighting has been unusually violent throughout the month. In the Steentraete sector, which has been particularly active, there has been in addition spirited grenade fighting.

Reports of artillery fire seem to indicate a capacity for this arm to concentrate with increasing accuracy and efficacy upon special targets. For instance, one of many similar reports describes the destruction by French shells of two outposts and mills at Châtillon, northwest of Soissons, which had been organized for defensive purposes.

Reports from the Artois tell principally of mine fighting.

With their customary persistence the Germans have continued to work for the complete recovery of the trenches lost to the French last September in the Champagne region. A night attack upon Hill 193 with hand grenades, early in the month, was repulsed. Their most noteworthy effort, however, came the following week. After a violent bombardment, in which suffocating gas shells were extensively used, the Germans attacked with three divisions over a

five-mile front, from La Courtine to Mont Tetu. The French "seventy-fives" are credited with stopping this attack, but not until several hundred yards of trenches and four hundred men had been captured. French counter-attacks were partially successful in regaining ground. The French claim that 60% of General von Einem's 50,000 men were lost in this assault.

Nancy, secure since the early days of the war, has this month been distantly bombarded by German 15-inch guns, and attacked with bombs by hostile aviators.

Perhaps no one position on the Western front has been the center of such a prolonged struggle as Hartmansweilerkopf. This peak, north of Thann, and some 2900 ft. in altitude, commands the plains of Alsace to the east; early in the war the Germans organized its rising terraces as a part of their third line of defense in the Vosges. In March, the French captured the mountain with a rush; in May they lost it, unable to withstand the fire of German artillery from the higher flanking peaks. This maneuver has been frequently repeated. In December the French Chasseurs made a particularly desperate effort to capture the crest, and made some substantial gains. During January this year-long fight has continued with much determination. By the middle of the month, each side had lost upward of 1000 prisoners. The French have admitted the loss of the neighboring summit of Hirzstein, and with this gain the Germans claim to have won back all the ground lost in December.

The report of nineteen air battles on Jan 17 indicates the continuation of aerial activity. Raids are of common occurrence. The Fokker type of German aeroplane is proving formidable with its great adaptability to maneuvering and fighting.

#### Feb

Not since September has the western front seen such extensive and continuous fighting as during this mid-winter campaign. Not in one locality, but in several, the Germans are proving their ability to maintain the offensive by making powerful, well-sustained attacks. It is estimated that their reinforcements in this area must number some 600,000. It is too early (Feb 20) to estimate the full significance of these movements, but it seems clear that the Germans, for one thing, are striving to win stronger defensive positions for future resistance. The Anglo-French gains of September have caused them no little concern, not so much by their actual yardage as by the threat constantly presented of piercing the sides of the great salient thrust into French territory. In the Artois region, especially, the German defensive line about Lens had been driven to the last ridge of hills that separates this rolling country from the level plain to the east. Another such drive as the September one, properly supported with artillery, and the Allies might hope to carry this line by sheer weight of numbers, and with it the whole section of France.

From Hill 70, just north of Lens, the oppos-

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ing lines face each other along a huge semicircle, some six miles from tip to tip, the southern end of which rests near Thelus. Gradually, the French had pushed eastward until some of their positions, notably on Hill 140, near the southern end of this line, dominated the low ground to the east, creating a situation intolerable to German security. In this region, the past month has seen some of the fiercest fighting of the war. The German attacks commenced on Jan 26, just northeast of Neuville-St. Vaast, and were vigorously maintained. As seems to be the usual procedure, these assaults were preceded by the springing of heavily charged mines, fifteen or twenty yards in front of the hostile trenches. Seven mines, in one case, covered a mile and a quarter front, and contained 1000 pounds of high explosive apiece, causing craters eighty feet wide and thirty feet deep. Into the wrecked trenches the Germans charged, and after terrific fighting won and held most of the ground contested.

As a result of this and other attacks, and the resisting surge of French counter attacks, the Germans can claim some definite, but not considerable, gain, along a mile or two of front. In the region of La Folie, especially, the French have been pushed back nearly to the Labyrinth, so desperately striven for last summer. On the other hand, the German losses have been enormous; 60,000, it is estimated, have been sacrificed on this narrow front, some 5 per cent of the total number holding the western line.

The most considerable German gain recorded in 1916 occurred somewhat farther south, close to the south bank of the Somme. This powerful attack developed on Jan 29 and resulted in the capture of the village of Frise, and some 1300 prisoners. Later reports indicated a total German advance of about 1000 yards over a two-mile front.

The Champagne region, too, has been the scene of considerable activity on the part of the artillery, mining operations and occasional attacks. German trains on the lateral supply road are sometimes subjected to bombardment, so near are the French positions to this line. On the Butte de Mesnil (Feb 12) the French gained about 300 yards of German trenches and held them against counter attack. Here the French shells smashed the German tanks containing suffocating gas, and the wind carried the fumes back over the German lines. On the other hand, northwest of Tahure, the Germans stormed French trenches 700 meters in extent, capturing 300 men.

The extent of German activity is indicated by the report of Feb 15 of the capture of 600 yards of British trenches at Hooge, near Ypres. The loss of this trench (called the "international trench," on account of its frequent change of ownership), is ascribed by the English to the springing of five mines, which rendered it untenable. The fighting about Ypres has continued obstinately.

Another manifestation of long-range bombardment was afforded the second week in

February by the shelling of the strong fortress of Belfort, on the eastern frontier of France. On several successive days from three to ten big shells were dropped within the fortifications.

The reports of air fighting indicate an increasing activity in this field, fourteen combats being reported in one day. "As an offset to the numerous British air losses, a late report tells of a notable success by one of their airmen, who in one day destroyed three of the dangerous Fokker machines. The new British battleplane is fast and deadly."

The Germans assert that since last October on the western front, the British have lost 63 airships, as against 15 lost by themselves.

**March**

During the preceding month, Germany had kept her opponents guessing as to her real intentions by a series of attacks upon the French and British positions in the west. Her preparations dating from December in the vicinity of Verdun, however—the new railroad lines, the enormous stores of artillery and ammunition—had not entirely escaped French notice, so that the Crown Prince's drive did not come entirely as a surprise.

Seven army corps were assembled for this vast enterprise, bringing the total number of troops in the vicinity up to at least 400,000 men. The Kaiser himself came to inspire his troops with his presence, and superintended the dress rehearsal of the attack, in which each division assumed its assigned position and was instructed in its part. It is said that a map of the fortress, prepared from photographs taken from aeroplanes, was distributed to every soldier. Soon after the bombardment opened on Feb 21, Verdun had become the chief center of interest of the war.

The first German drive developed straight south against the apex of the Verdun salient. Extending over a seven-mile front, from Consenvoye to Azannes, their heavy attacking columns comprised about ten men to the yard. After a prolonged bombardment of heavy artillery, these masses of infantry struck the French advanced lines with a shock that would not be denied. Fully a mile was gained the first day, and the advance continued by daily surges until, at the end of a week, the Germans had halved the eight miles which had separated them from Verdun. Their right, advancing along the Meuse, had reached Champneuville; their center, having won Beaumont, faced the formidable ridge known as the Côte de Poivre; while the left, after capturing Ornes, hurled itself against Fort Douaumont, the most northerly of the permanent forts of Verdun. After several costly repulses, this fort was stormed and held by the 24th Brandenburg Regiment. (Verdun has twice previously been captured by Brandenburg troops, in 1792 and 1870). The Germans claimed the capture of 17,000 prisoners during this first week; the French, for their part, asserted that the German losses had been enormous. A heavy fall of snow added to the difficulty and discomfort of the campaign.



For the second phase of the attack, the scene shifted to the east. The French had been pushed back to a strong defensive line extending west from Douaumont along the Côte de Poivre to the Meuse. Heavy attacks were now launched against Mauheulle and Fresnes. Carrying these points, the Germans won their way across the Woevre plain to the edge of the plateau on which the permanent forts are constructed. West of Etain, they advanced several miles along the railroad to Eix, some five miles from Verdun. Their gains on this side, though totaling a greater territory than on the north, are hardly as striking an achievement. These joint gains amounted to over a hundred square miles.

The climax of the operations in this sector came in the assaults on the fort and the village of Vaux, two miles southeast of Fort Douaumont. Like the latter spot, this locality became a "key-point" about which the battle raged for days. From the conflicting reports, it appears that the German infantry finally won the village, but have failed to carry the fort and the slopes to the east. There has been a tendency, in the accounts of the battle, to attach too much importance to the occupation of such points as these. The part played by this type of cupola emplacement has been modified by the developments of heavy artillery, the forts have probably been shorn of their big guns, and the fall of one of them no longer carries its former significance.

It was inevitable that the territory just west of the Meuse should become a third theater of operations. The German advance east of the river soon found its flank dangerously exposed to the advanced French batteries on the west. Moreover, a successful drive down the valley promised to cut the railroad running into Verdun from the west. Commencing their attack here on Mar 6, the Germans soon took the towns of Forges and Regnéville. Their further progress was barred by two strongly fortified heights, the Côte de l'Oie and Le Mort Homme, both over 800 feet high. The lower hills between them are covered with timber known as the Bois des Corbeaux, and had been strengthened with entanglements and batteries. Here the lines surged back and forth, resulting eventually in German gains; so that their advance, some two miles south of Forges, brought their line into approximate alignment with their positions farther east, and threatened the French line, strongly posted on Le Mort Homme.

The three phases outlined above have not been entirely distinct, but have overlapped and alternated with each other in a way which has left the German strategic plan very much obscured. Activity has continued, though in a less intense degree, along this entire front, and even as far west as Melancourt, where German gains were reported on March 21, just one month after the commencement of the campaign.

A striking development of the Verdun attack is the prevalence of hand-to-hand fighting by infantry. The theory of the artillery is to utterly demolish, to pulverize the defensive

position at long range. And never before, in this war or any other, has artillery been used as at Verdun. French artillery officers estimate that in the first four days of the attack the Germans fired 2,000,000 shells. But the ground thus torn up must then be occupied by the charging infantry lines, occupied and held against desperate counter-attacks; then come the terrific clashes that have marked this contest.

General Pétain is in command of the fortress, having been called to assume that office on two hours' notice.

One is tempted to neglect the remainder of the western front, overshadowed as it is by the events at Verdun. The activities at several other points, however, would have attracted attention during an ordinary month.

North of Ypres the Germans gained 350 yards of trenches, and occupied a position more threatening to British command of that city than any they have previously held. During the second week in March, however, the English, by recapturing some trenches lost the preceding month at the bluff of the Ypres-Comines Canal, materially improved their position.

In the Givenchy woods, the Germans made an important gain over a 900 yard front, and captured 350 men. It is probable that the British lines have been extended through this territory well to the south of the Somme, to cover the withdrawal and transfer of French troops to Verdun.

Activity has continued in Champagne. The capture of a German salient with 300 men near Maisons de Champagne, was offset the next day by the capture of 1600 yards of French trenches near the Navarin Farm, with 1000 prisoners. This was followed, about the middle of March, by a successful German assault eleven miles northwest of Rheims, where the attackers penetrated the French lines for two-thirds of a mile, and took 750 prisoners.

In the Vosges, a notable increase in German activity was recorded. Their most considerable advance was made west of Heidweiler and northwest of Altkirch, where they gained 400 yards over a 700 yard front.

The aerial warfare has been marked by an event of much interest,—the destruction of a great late-type Zeppelin, the LZ-77, by a French anti-aircraft gun near Revigny. Detected by a French officer who heard the sound of its engines, the dirigible was soon picked up by searchlights and exposed to the fire of all the batteries in the district. Five motor cars armed with naval anti-aircraft swivel guns rushed along the roads, firing small shells which explode on contact with the aluminum frame of the Zeppelins. Three shells hit the airship, which fell to earth a flaming wreck, with from thirty to thirty-five burned bodies of the crew.

Among the numerous air-raids reported during the month, one of Mar 20 is noteworthy, in that it comprised 65 French, English, and Belgian machines, the largest number that has taken part in a single expedition during the war. The fleet, which carried 200

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pounds of explosives per machine, attacked the German sea-plane base at Zeebrugge. All the aeroplanes returned safely.

The exploits of individuals in these air-combats are frequently chronicled. The German lieutenants Immelmann and Boelke appear to head the list, with ten and eleven hostile planes to their credit, respectively.

**April**

Though fought for the possession of a fortress, this supreme battle of the war has been fought almost entirely outside the forts. West of the Meuse, where the Germans have been delivering their heaviest blows, apparently hoping to break through to the railroad lines of supply leading into Verdun, not a fort has been reached, or even mentioned. A patch of woods, a hilltop, a ridge,—these have been the prizes contended for. The value of a fort has been discounted; but the value of a man has risen. Flexible, intelligent, skillful, the soldier improvises his own fort of up-turned earth.

The fifth week of the campaign saw the point of attack shifted still farther west, about three miles beyond Le Mort Homme. On March 21 the Germans, after strong artillery preparation, captured the wood northeast of Avocourt, with 3000 men, and the next day, followed this up by taking Haucourt Hill. This left the French positions at Malancourt and Bethincourt critically exposed—a protruding tooth with two deep dents on either side, and hardly two miles apart. The most of Le Mort Homme, as well as the woods that flanked it, was now held by the Germans, taken after a week's severe resistance. In attacks the Germans made extensive use of their *Flammenwerfer*, which, operated like portable fire extinguishers, throw streams of blazing oil on the opposing trenches.

During the next week, several days of artillery fire without infantry attack gave the Allies the hope that the offensive was abating; this was merely a necessary period of reorganization and preparation for further advance. On the night of March 30, the town of Malancourt was attacked from three sides, and carried by dawn, with 325 prisoners, after hand-to-hand fighting through the streets. The Bethincourt position was thus rendered the more precarious, though the French succeeded in retaking a small section of Avocourt Wood.

Meanwhile, to the east of the Meuse, after a period devoted to bombardments of the Douaumont ridge and vicinity, infantry attacks were vigorously resumed. A sudden attack was launched up the little ravine in which lies the village of Vaux, and the ruined town was captured, after a bitter struggle. The next day Caillette Wood, between Vaux and Douaumont, was penetrated by a strong German attack. The French first lines about 300 meters south of Douaumont village were successfully defended against a German assault, in which the attack was made in successive waves of great strength.

Caillette Wood, the first week in April, continued to be the scene of severe fighting, but the chief center of interest shifted back across the Meuse. On April 5 the Germans stormed and took the village of Haucourt, half a mile southeast of Malancourt. The French had repulsed many assaults, and fought stubbornly to the end. The withdrawal from Bethincourt, now rendered inevitable, was made skillfully on April 8, with small losses; the new French line was established a mile to the south. Keeping the offensive, the Germans continued to make gains in this region, penetrating the French lines on Hills 265 and 295, (near Le Mort Homme) and capturing a mile and a quarter of French trenches on Termiten Hill, south of Haucourt, with over 1200 men. This latter gain marks substantial progress toward Hill 304, one mile north of Esnes, the key position of this whole region.

Elsewhere in the western theater, activities have been on a minor scale, though pretty general in scope. At St. Eloi, south of Ypres, two British regiments, after exploding mines, assaulted the German salient, and captured first and second line trenches on a front of 600 yards with 200 men (March 27). Since then the fighting for these mine craters has continued; and some of them have been lost by the Canadians and won again.

The air service of both sides has shown tremendous activity. Seventeen French aeroplanes with great accuracy dropped 40 large caliber bombs on the railroad station at Conflans, and 14 on the station at Metz (March 18). Fires and explosions resulted, and although heavily bombarded, the whole air squadron escaped. Such raids, of which there have been several, have doubtless interfered to some extent with the supply lines of the German armies at Verdun.

"The battle of Verdun, unprecedented in the amount of ammunition expended and probably also in the numbers slain, is unique in another respect as the first time in history that aeroplanes have taken an active part in the fighting. They are employed not only against other planes, but against troops. When the Germans were bringing up a battery to shell Pepper Ridge (Côte du Poivre) an air squadron swooped down upon them and dropped bombs from an altitude of less than a thousand feet. The first series of bombs killed 9 horses and 30 men. With other horses wounded and frightened the guns could not be moved, and the soldiers abandoned them and ran to cover.

In one day the French reported 20 aerial engagements in the area northeast of Verdun. Sometimes these are duels, sometimes a score of avions participate.

The most famous of French airmen is Sub-Lieutenant George Guynemer, who has brought down eight German aeroplanes single-handed. Lieutenants Immelmann and Boelke of the German army have each accounted for their thirteenth Allied aeroplane.

**May**

Three months have not sufficed for the Verdun campaign to reach a decision. One of

the most striking lessons of this intensive siege has been that troops and mobile artillery protect a fort, rather than that they are protected by it. To sum up the extent of German gains, 150 square miles of territory and some 30 villages have been won. Their lines have been shortened from 40 to 30 miles, and pushed forward an average distance of three miles. At Fort de Vaux they are less than four miles from the city; while their position at Avocourt is but four miles from the main route to Paris. It is in this latter vicinity that the Germans have made their most stubborn attacks of late.

During this month, the French have not been content with a passive defense. Their whole resistance has been characterized by soldierly qualities of the highest order. Assuming the offensive toward the end of April, their counter attacks were felt at three places,—near Vaux, in the Caillette Wood, and north of Le Mort Homme. The latter assaults, which reached their climax about May 3, resulted in the capture of 1000 yards of German trenches, and of several hundred prisoners.

This French counter-offensive merely marked an intermission in the German assaults. On May 4, the latter were resumed with undiminished intensity. Hill 304, the dominating point of the entire ridge west of the Meuse, was the objective of these attacks. A single week saw seven different assaults, aimed either between the crest and Le Mort Homme close by to the east, or farther west where a shoulder juts out from Hill 304, known as Hill 287. East of the hill, the French trenches and underground shelters were finally completely shattered by large shells, and were then carried with the aid of clouds of suffocating gas. The Germans claimed during this week the capture of 1500 prisoners. On the whole, their assaults seemed to have a tendency to shift farther to the west, around the base of Hill 304. Yet, as the month closed, Le Mort Homme continued to be stubbornly contested, with conflicting reports as to its possessors.

Coincidentally with these gains west of the Meuse came a renewal of German activity about Vaux. As a result of four successive attacks between Haudremont Wood and Fort Douaumont, 500 meters of French first line trenches remained in their possession.

Further progress into the Caillette Woods, south of here, has since been made by the Germans.

Says the *Army and Navy Journal*:

"In summarizing the operations to date it seems fair to remark that in both the attack and the defense military technique has shown the most complete development known to the science of war. The defense has been called upon to exert its strength to the utmost to retard the advance of the assailant and has succeeded remarkably well, but has been unequal to the task of dislodging him from the positions he has gained."

General Petain, who has had charge of the defense of Verdun from the beginning of the battle, has been appointed to the chief com-

mand of the entire right wing of the French Army. He is succeeded at Verdun by General Robert G. Nivelle, who was at the beginning of the war merely colonel of the Fifth Artillery.

The reports from other sectors of the western front, though they have a monotonous similarity, indicate considerable activity, especially along the British sector. From Ypres to the Somme, mining operations, trench and mortar fights, and an occasional night raid, have been the rule. Especially noticeable have been the German activities in the vicinity of Lens. At the old Hohenzollern redoubt near Hulluch, they succeeded in capturing some British trenches. North of Armentières they sapped and blew up the front trenches.

It is rumored that the Germans are making great preparations for a desperate attempt to break through the British lines and reach Calais, and that among the troops collected for this purpose are Turks and Bulgars. This report, whether true or not, may be intended to offset the effect of the announcement by the French that they have been receiving reinforcements of Russians from Port Arthur on the Pacific. While there is no authoritative information as to the number of Russian troops in France, this proof of Allied cohesion has undoubtedly been of moral value.

In the descriptions of the ever-increasing aerial activity on both sides, reports of combats seem even more numerous. Raids and individual exploits are chronicled, too numerous to mention.

More than two miles up in the air over Zeebrugge a French aeroplane fought a Zeppelin at 3 a. m. on April 26.

The tactics of the air are described in a British report, which describes how four of their machines flying in formation drove a wedge among eight opponents and after a fight of ten minutes compelled four of the hostile squadron to descend.

The French report claims for April a total of thirty-one German aeroplanes destroyed on this battle line.

*May 20-June 20*

German assaults against the long-coveted salient at Verdun, instead of gradually weakening, as it was freely prophesied would be the case, have rather increased in intensity. The French report their later attacks, against Le Mort Homme and Fort Vaux, stronger and more deadly than any in the early stages of the siege or in the whole war. Sometimes comes a respite of a few days, after which fresh German troops are hurled with unimpaired vigor against the French positions.

Thus it has been at Le Mort Homme. From one angle after another the Germans had charged this position, finding the greatest measure of success between it and Hill 304 on the west, where their troops penetrated and effected a lodgment. Now came an attack from a new quarter, through the town of Cumières, close to the Meuse, which the Germans took on May 23. Realizing their danger from this direction, the French counter-attacked strongly, recapturing part of the

**EUROPEAN WAR—Continued**

town. Then on May 30, after successive whirlwind attacks in which a new division, not previously seen at Verdun, made its appearance, the Germans were the possessors of the Caurette wood, on the eastern flank of Le Mort Homme, 1300 prisoners were taken, and the French were nearer to losing this vantage point than at any time during the siege. As it is, with the Germans entrenched on the north slope and occupying positions well around on each flank, the hill is in danger of being pinched out, as it were, from the French lines.

East of the Meuse, more important German gains have been made. The first advantage was won by the French, who by a surprise attack on May 22 took Fort Douaumont from its German captors, together with 300 prisoners. This advantage the French could not maintain, however, and 10 days later the Germans had regained all the ground lost, taken the Caillette Wood with 2000 prisoners, and made headway south of Fort Vaux. This gain, together with the progress made from Damloup on the east, gave the Germans access to Fort Vaux on three sides, and made its eventual fall inevitable. Major Ragnal, a young but distinguished officer, was left in the fort with scarcely a thousand men. The little garrison, by its effective machine-gun fire and by hand-to-hand conflicts, kept the Germans out for five days. When the 700 survivors finally surrendered, on June 7, the commander was permitted to keep his sword.

Since the capture of Fort Vaux, some further progress has been won by the Germans. Gains have been made in the vicinity of Chapitre Wood, near Fleury; and a successful attack made on Hill 321, west of Thiaumont. Forts Souville and Tavannes have been heavily bombarded. West of the Meuse, Chattancourt has been violently shelled, but little progress made in that direction.

The Ypres salient, also, has been the scene of severe fighting. On June 2, after an intense bombardment, German infantry attacked toward Zillebeke over a 3000 yard front, and drove a wedge 700 yards deep through the Canadian troops occupying that sector. The Canadians counter-attacked with partial success the following morning, but much of the recovered ground was lost again. Their losses were heavy, including two generals. After incessant fighting between this point and the famous Hill 60, the Germans on June 7 captured the British position of Hooze, inflicting heavy casualties. A Canadian attack on June 13, which had for its object the recapture of the lost positions in the Hill 60 sector, was more successful than its predecessors, and won back a front of 1500 yards.

The activity elsewhere on the Western front, in the nature of mining operations, bombardments, reconnaissances, etc., does not call for special mention.

English casualties in May amounted to about 1000 a day.

*June 20-July 20*

Some time before the Battle of the Somme,

the *London Times* published a somewhat remarkable map, on which were shown the positions, by corps and divisions, that the German units facing the British on the western front were supposed to occupy. According to the English estimate, these forces numbered between 600,000 and 800,000 men, or about four men to the yard for the entire front. Close to Albert, the German line bent sharply eastward so as to form a salient, then turned south, crossed the Somme, and swung around toward the "elbow" at Noyon. In this sector, the Allies decided to launch the long-expected drive. Opposite the English and French sections of the line, respectively, lay Bapaume and Peronne, both railroad centers of some local importance. The capture of these towns would open the way to the more vital railroad junction of Cambrai, and threaten the German lines in flank, somewhat as von Mackensen's smashing blow a year ago compelled the outflanked Russians to fall back from the Carpathian passes.

The preparation for the advance was noteworthy, not only for the intensity of the bombardment, but also because of the successful employment of raiding parties, which made nightly raids on the opposing trenches, ascertained the damage done by the artillery, and brought back prisoners and information.

On the morning of July 1, the new rapid-fire trench mortars of the Allies were simultaneously turned on the German first-line trenches. After a deluge of shells, lasting exactly 10 minutes, this artillery fire was raised to the second line, and forth from their shelters came the charging lines of French and English. In many places the German entrenchments had been literally blotted out, and here the advancing forces found it easy to sweep through to the second and third lines. In other localities, their bombproofs, deep underground, had been little disturbed by the heaviest bombardment. The French, under General Foch, who were more successful at the start, penetrated on the first day to a depth of two miles. The British advance was directed by General Sir Douglas Haig from the direction of Albert. Their first rush carried them almost to Contalmaison, but symptoms of the old failing were evident in the slowness of the supporting troops to arrive, and some of the advantage gained was surrendered.

These initial moves proved to be merely a beginning. Thus the new offensive differed from the dashing attacks of a year ago, and resembled rather the German offensive against Verdun—a steadily maintained *push*. The French continued to gain ground, until at the end of nine days they had driven into the German line a well defined wedge four miles deep, with its apex at Biaches close upon Péronne, and its flank at Estrées on the south and Hardecourt on the north. Here the French halted, as if to wait for their more backward allies on the north.

The story of English progress is one of desperate fighting, of small gains often lost by counter-attacks. The small towns contended

for are too numerous to mention here, but the general direction of progress can be traced. When the effective resistance of the Germans at Thiepval and Ovillers blocked the attempt of Haig's men to advance due east, a tendency was evident for the British attack to work around to the south into the salient that had been created, and to be directed toward the northeast and north. In this manner the English had penetrated to Montauban, and on July 14, to Longueval, three miles behind the original German front, where they now tied in to the French left at Hardecourt. On the 15th they had advanced close to Pozières and pierced the German third line. It was near here, in Faureaux Wood, that British cavalry, for the first time since 1914, had a chance to take part in an attack. In the meantime, after a costly battle, the British had at last taken Ovillers, and with it captured 126 surviving Prussian guards. To these brave fellows the Englishmen paid every respect, the reserves instinctively presenting arms as the prisoners were led to the rear. With these gains, the British have occupied an area approximately equal to that of the French, their united acquisitions being somewhat less than the German gains at Verdun. Bapaume is some six miles distant from the nearest English force.

Although Verdun has been eclipsed in interest by the developments on the Somme, there has been no abatement of the German offensive in that sector. On June 23, an attacking column of over 100,000 men made an important advance along the Froide Terre Ridge to the village of Fleury. This village, which the Germans now hold, is only two and a half miles northeast of Verdun, to which the investing lines are drawing ever closer. On July 12, the Germans delivered a heavy attack on Fort Souville; six regiments moved south from Fleury and Vaux, and gained ground less than a half-mile north of the fort, capturing 2500 prisoners. The Thiaumont sector has also seen severe fighting, and heavy assaults have been hurled at Hill 321. West of the Meuse the French have prevented any considerable advance of the besieging forces at Avocourt, Cumières, and Hill 304, where there has been much fighting. Nearly all of Le Mort Homme is now held by the Germans.

There have been activities at various other points along the western front—heavy bombardments in Belgium, surprise attacks, an increasing number of air raids—but nothing of comparative importance.

#### *July 20-Aug 20*

An interesting report comes thru British sources of a diary found on a captive German officer. According to this "revelation," the Germans in June had concentrated at Roye over 20 divisions for an assault on the French lines at that point. The offensive on the Somme forestalled their intentions (according to the diary), and found that sector of the line weakly held by five divisions, which were overwhelmed by the enemies' amazing strength and infernal bombardments.

At the end of the first three weeks of the campaign, the English had pushed eastward and northward until they had driven into the German lines a salient some four miles deep, pointing fairly at Bapaume, with its apex near Longueval. On either side, to the west toward Pozières, and southward about Maurepas, there were left great bulges held by the Germans and extending into the Allied lines. Roughly speaking, it has been a month's task for the Allies to rectify these bulges, the British advancing on the left, and the French practically abandoning their operations about Péronne, and concentrating their attacks between the English and the town of Cléry.

On July 23, General Haig renewed the offensive on a large scale from Pozières to Guillemont. After the fiercest kind of fighting, the Australian troops of General Birdwood won about half of Pozières, and in three days occupied all of the town. Farther east, at Longueval and Guillemont, the British were less successful, being unable to gain. It was the Brandenburg Grenadiers who repulsed them at Longueval,—the regiment which won fame at Fort Douaumont was now needed elsewhere.

On July 27, the British renewed the attack on Delville Wood, just east of Longueval, after what was reported to be the heaviest concentration of shell fire ever directed against field fortifications in a given area. In the artillery preparation, over a thousand-yard front, about three shells fell every minute per yard of front. This attack succeeded in regaining most of the wood, which the British had won on July 14, only to lose before German counter attacks. In this rolling country, where there are none of the rugged hills that surround Verdun, a well organized wood becomes a position of no little strength; and in the Battle of the Somme, some of the most bitter fighting has centered about the woods of Delville, Fourceaux, Trônes, and Hem.

The Australian troops in the vicinity of Pozières continued their successes, and on Aug 4 penetrated the German second-line trenches some 500 yards, over a two-mile front between Pozières and Thiepval. Their gains included Hill 160, the highest point in the vicinity, whence the ground slopes gradually to Bapaume. This advance was bitterly contested by the Germans, von Buelow's troops making five separate attacks on the new positions on Aug 17, and again on the 18th, with slight success. In general, the English gains in this region were secured and extended, until a threatening curve was drawn around Thiepval.

Meanwhile, to the right of the British, the French had been doing their full share to drive the wedge deeper. By the end of July they had captured Hem Wood, taken some lines of trenches a half mile deep, and advanced to the outskirts of Maurepas. German counter strokes were numerous, and on Aug 1 the station at Hem changed hands six times. On Aug 8, after long continued and severe fighting about Monacu Farm, the French lines surged forward again a quarter of a mile.

**EUROPEAN WAR—Continued**

This success, and others equally hard-earned, paved the way for the capture of Maurepas, which straightened out the line from Cléry, near the Somme, to Guillemont, and which now threatened Combles from the south. On the north, the English line, now approximately straight, has approached the outskirts of Martinpuich. Guillemont is still untaken.

South of the Somme, as already intimated, there have been no major attacks, and no material change in the alignment, altho there has been much fighting in the vicinity of Estrées, Barleux, and Vermandovillers.

In connection with the Allied offensive, more aerial fighting is reported than at any previous time.

"Both sides admit very heavy losses in the air service. Constant reconnaissance aiming at the detection of reserve depots and communications, has met most determined opposition both in the air and from anti-aircraft guns."

Battles in the air are a daily occurrence. On the night of Aug 9-10, French aerial squadrons dropped 413 projectiles upon hostile lines of communication and artillery positions. The next night a fleet of 68 British aeroplanes raided the rear of the German lines, losing two of their number.

"The battle for Verdun," says Mr. Simonds, "finally became an assault upon French confidence, endurance, nerves, and as such it endured for five months and continues; but now it has fallen from the highest estate in a world war, the focal point in the attention of a whole planet, and become an almost forgotten detail, as remote as Przemyśl."

If the German and French troops left facing each other are now forgotten, at least *they* have not forgotten how to fight. All during the month they have grappled with each other for the possession of Thiaumont and Fleury. The Germans had held Thiaumont since July 3, but early in August, the French started a series of attacks that resulted in its capture, and subsequent loss, for several successive times. The Germans finally remained in possession of the town, but were less successful at Fleury, where the French won and maintained a footing, the hostile lines meeting in the ruined houses of the town.

The Germans, advancing south from Fort Vaux on Aug 1, made some gains in Le Chapitre Wood and at Chenoic, a mile north of Fort Souville, capturing a thousand prisoners. West of the Meuse, there have been no important actions.

Beyond the usual mining operations, bomb throwing, and skirmishing, little else is reported from the western front, except for a strong German attack in Champagne, over a 1200 meter front. Its initial success was speedily offset by counter attacks.

*Aug. 20-Sept. 20*

The Battle of the Somme in many ways resembles the German offensive at Verdun. It is being fought on both sides of a river valley, with the point of attack shifting all along the line; it is a persistent push, rather than a sudden thrust; infantry attacks are

made only after devastating artillery fire has reduced the hostile works to atoms; finally, the total amount of territory gained by the assailants does not differ widely. It would be unfair to the Allies, however, to stop the comparison at this point. The Verdun affair is practically a closed chapter; the Battle of the Somme is still to be decided. Moreover, unlike the former, this latter offensive is showing evidences of greater power as the third month draws to a close than at the end of the first. The gains in recent days have been striking, and there are not lacking signs of weakening in the sorely-pressed German lines.

Without attempting to recount in detail the Allied gains from day to day, and the German counter-attacks that disputed and often negated these gains, it is possible to outline some of the most brilliant advances. On Sept 3, both English and French joined in a splendid assault along the 6-mile front from Ginchy to Cléry; the British captured Guillemont and secured a hold on Ginchy; the French won Leforest and Cléry. About 2500 German prisoners were taken. The next day the French, attacking unexpectedly south of the Somme, stormed the villages of Soyecourt and Chilly, and reached the outskirts of Vermandovillers and Denicourt.

In a new surge forward, on Sept 12 and 13, the French from Leforest advanced until they reached the main road that connects Bapaume and Péronne. The result of this brilliant stroke was to leave them in secure possession of some two miles of the road, from Rancourt to Bouchavesnes, thus blocking an important enemy line of communication. The French artillery was reported to have been more effective than ever in this engagement.

The British contributed their share on Sept 15, when the lines of the Crown Prince Rupprecht, east of Thiepval, were crushed in from one to two miles over a six-mile front. This left the English in possession of Courcellette, Martinpuich, and Flers, the latter town only 4 miles from Bapaume. It carried them, moreover, cleanly through the "third line" that the Germans had originally prepared on this front. The fortifications now facing them are lines improvised since the Somme offensive began, and are, of course, less formidable than the more deliberate works.

The position the English now occupy is well over the crest of the ridge of hills between Albert, their starting point and Bapaume. From Martinpuich and the neighboring ground they can "look down" into the town which is now their immediate objective. Thiepval on their left still remains a German stronghold, though pocketed by the encroaching British lines. In a similar way, the French and English forces have crept around three sides of Combles, the fall of which seems imminent.

The air services are playing an important part in this great battle, and their losses are very heavy on both sides. The Allied air fleets appear to have the whiphand, and have contributed materially to the success of the armies by their reconnaissance, their raids

against the hostile lines, and even by actual participation in the fighting.

The Germans estimate their adversaries in this battle to number thirty-seven British divisions and twenty-three French. The English report their losses for July and August as 180,000; the Germans place this figure much higher.

The operations against Verdun have dwindled to isolated attacks of little moment in the region between Fleury and Vaux, and about Thiaumont. The French have won back, and now hold, the points that marked the culmination of the German advance at the time when developments on the Somme put an end to their efforts. Thus this mighty assault failed completely, tactically in that Verdun was not won, strategically in that the Allies were not prevented from launching their offensive elsewhere.

The remainder of the Western front can be briefly dismissed. One notes with interest the employment of Russian forces at various points in the line. The British, along their lines, are using gas to a greatly increased extent.

"As this battle of the Somme has developed," comments the *Army and Navy Journal*, "certain characteristics have become pronounced. The Allies are to a great extent masters of the air, and although their losses have been severe in both personnel and matériel they are, broadly speaking, able to carry their own reconnaissance effectively back of the German lines while preventing any thorough examination of their own rear.

"The Germans are able to make every hostile advance exceedingly costly, but their guns are kept so far to the rear that they cannot prevent the destruction of trenches and entanglements selected by either British or French for attack. A fact of particular significance is that no German counter-attack has succeeded in winning back any position once lost. The military science of both British and French has been so thoroughly developed by the hard lessons of experience that all arrangements are perfected for the adequate backing up of any detachment which fights its way into a new post."

In the hard-won advances of the Allies, the severest fighting has centered about the little French towns and villages which had been made key-points in the German defensive system. Thus Thiepval, with its dozen lines of trenches which appear on the published map, had been the rock on which rested the German right, at the point where the bulge in the original line began. Farther east, at the junction of the French and English lines, lay Combles, on the Péronne-Albert railroad, formerly a town of 2000 inhabitants, and the most important center the Allies had yet reached. For some weeks the lines had crept up toward these strongholds, then surged past on each side, forming deep pockets about the doomed towns. Pushing their jaw of the closing vise north of Rencourt, the French had almost surrounded Combles, except for an alley

somewhat over a mile in width, leading north-east from the town. Through this gap most of the regiment that comprised the garrison made their escape the night of Sept 25. The Allies, when they entered the town the next morning, captured few prisoners, but a considerable quantity of munitions and supplies. The French loss of 5200, in two days' fighting for this prize, is contrasted with the 50,000 lost in Champagne a year ago. The capture of Thiepval by the British occurred the same day, and was a similar story of gradual envelopment and final squeezing out.

Oct

After these notable gains, the Allied advance slowed perceptibly. The usual necessity existed for organizing the new positions; rain seriously interfered with extensive offensive operations; finally, German resistance, far from weakening, made redoubled efforts to prevent further encroachments. Casualty lists became longer as territorial gains became smaller. The only successes of importance were the capture of Le Sars by the British, on Oct 6, and the occupation of Saillv-Saillisel by the French on Oct 17. The former position brings the English within four miles of Bapaume; the latter forms the apex of a wedge being driven deep into the German lines between Bapaume and Péronne.

South of the Somme, as the result of severe fighting, some headway has been made toward Chaumes, especially in the vicinity of Ablaincourt. This town of Chaumes has formed the anchor for the south end of the German line, as did Thiepval the north.

During the first three months of the campaign, the English report the capture of 27,000 prisoners; the French have taken 30,000. The British losses are officially reported at 307,000, or about 3500 a day. Sir Douglas Haig reports that 38 German divisions have been engaged, of which 29 (about 350,000 men) were withdrawn exhausted or broken.

Of the work of the aerial service, the British commander-in-chief reports significantly as follows:

"Our aircraft have shown in the highest degree the spirit of the offensive. They have patrolled regularly far behind the enemy's lines, and have fought many battles in the air with hostile machines and many with enemy troops on the ground. For every enemy machine that succeeds in crossing our front it is safe to say two hundred British machines cross the enemy's front."

In comparison with preceding months, the last period has seen a slackening in the Allied offensive on the Somme. This is attributed by the Allies to the unfavorable weather conditions of storm and wind. In particular, the air service is reported to have been seriously interfered with by high winds, which have reached 80 miles per hour.

In addition to the British gains at the northern end of the line, the French have made some advances at the other end, just north of Chaumes. They now occupy the villages of Pressoir and Ablaincourt, the latter with its sugar refinery and cemetery,

**EUROPEAN WAR—Continued**

which have been contested for a month. There has been much fighting, but little change in alignment, along the most advanced positions of the Allies in the center,—several attacks toward Le Transloy, a shifting back and forth of the lines at Sailly-Sallisel. Opposite Péronne, the Germans have won back a French position in La Maisonnette which seriously threatened the city.

**Nov**

The British advance up the Ancre was reported on Nov 14, and is thus described by the *Army and Navy Journal*:

"The British attack on the two sides of the Ancre Brook astride the stream was preceded by four days of intense bombardment, followed by an early morning attack in a dense fog, such as an Englishman is supposed to be at home in, and which in this case concealed their movements from the Germans. The British are described as creeping within a short distance of the German trenches southeast of Armentières and then charging with loud hurrahs. The Germans appear to have counted too much upon the defensibility of the position, from which they were driven by a sharp thrust. They fought with their backs to the brook, which was swollen with the heavy rains, converting its banks into a marsh; much the same position in which the left wing of McClellan's army found itself at the battle of Fair Oaks during the early days of our Civil War. A large part of the German defenses had given way before the fierce bombardment preceding the assault. The British in their official report claim to have penetrated the German defenses on a front of nearly five miles, capturing on the 13th the strongly fortified village of St. Pierre Divion. The German positions north of the Ancre were part of their original line and were very strong."

Subsequent fighting has advanced the British lines to the outskirts of Grandcourt. British naval troops are reported to have been engaged in this Ancre offensive, and to have shared in the capture of Beaucourt. The armored "tanks" continue to play a rôle in the operations of the English, but the number reported put out of action by shell-fire indicates that the Germans are resisting them successfully.

During the four months on the Somme up to the end of October, the prisoners taken by the Allies are reported at 73,000, in addition to 308 guns. The total losses to the Allies are placed at 600,000, and are undoubtedly much greater than for the Germans. In a recent report by General Haig, the peculiarities of the terrain and the strength of the German "fourth line" are discussed:

"The German defense plans have taken full advantage of every sunken road, building and undulation of the ground. They are said to have constructed powerful positions at Le Transloy (north of Morval) and St. Pierre Vaast Wood. Deep tunnels provide shelter for large reserves of infantry and artillery, which can be rapidly shifted in security and

secrecy between these main positions, which are linked by this subterranean connection. By this means the Germans to some extent offset the superiority of the Allied air reconnaissance."

Surprising in its suddenness was the French stroke that won back in five hours what had taken the Germans five months to gain. The German lines about Verdun had been much weakened. General Nivelle, attacking on a four-mile front on Oct 24, with only 80,000 men, swept forward two miles in an afternoon, retaking Fleury, Thiaumont, both village and fort of Douaumont, as far as the quarries of Haudromont on the left and Fort Vaux on the right.

This success was followed up vigorously by the French, and all counter-attacks repulsed. Fort Vaux, now only 500 yards away, after being subjected to a heavy bombardment for six days, was evacuated by the Germans on Nov 1, making their escape by means of a tunnel. On Nov 4, the French occupied the villages of Vaux and Damloup, thus regaining virtually all the territory of pronounced value lost by them in the spring.

These brilliant operations appear to have been made possible by the work of the French air service. "According to the despatches from Paris, General Pétain regarded the front east of the Meuse as too cramped and suggested to General Nivelle, the commandant at Verdun, that he give himself—in a laconic phrase—'more elbow room.' The aviation department was commissioned to make an exhaustive survey of the positions of the German batteries and points of assembly, and the superiority of this arm of the French army was so great that it was not only able to acquire all the necessary information, but also to prevent the German airmen from getting any inkling of what was going on behind the French lines."

**See also**

LIEGE, DEFENSE OF  
OURCQ, BATTLE OF THE

**THE EASTERN THEATER**

The effects of winter's grip are evident in the slackening along the Eastern front. A Russian correspondent writes (Dec 29):

"The most severe part of winter has now begun in the Russian theater. All reports agree that the weather this year is harder than usual. It is increasingly doubtful if any serious events will occur until the end of January."

The first of the month saw a German success in the capture of the Borseünde position on the Dvina, seven miles from Riga. At Dvinsk, on the other hand, the Germans continued to lose ground about Lake Swenten and at Illuxt.

"From Dvinsk southward through the marsh lands of the Pripet, the Germans are settling down into their positions without any further efforts to push on toward the east. The forces left here are undoubtedly only sufficient for 'holding' purposes."

Along the line of the Styr, fighting con-



tinued in the effort to gain control of the left bank. A brilliant exploit by a cavalry patrol, early in the month, resulted in the capture of two German generals at the staff headquarters of the 82d German Division near Nevel, where the guard, attacked with bayonets and hand grenades, suffered heavily. Farther south, there continue to come reports of small engagements, in Bukowina and in the Tarnopol sector. As the month closes, there comes the news of a Russian offensive on the Bessarabian frontier, where the Russian assaults have so far been held in check, but are increasing in severity.

"Reports from Russian sources tell of the construction of very extensive defense works, trenches, blockhouses, wire entanglements, etc., along the line of the River Bug, with the reconstructed fortifications at Brest-Litovsk as a base. This line of German defense is a hundred miles west of the present positions along the River Styr." Though this may be regarded merely as a precautionary measure against possible subsequent Russian advances, there are plenty of critics who believe that German advance should have halted at this naturally stronger north-and-south-line, instead of attempting to win through to the next line.

General Russky states in a recent report that Petrograd is now supplying ample munitions, and he feels his artillery can hold its own against the Germans, although the latter still have an advantage in guns.

Not the least noteworthy fact about the latest Russian offensive is that the armies that seemed so thoroughly beaten and disorganized last fall could now begin with such vigor a new drive. Yet for nearly a month, from the Pripet River to the Rumanian frontier, in the face of opposing armies under von Mackensen and Pfanger estimated at 1,500,000 men, they have maintained an offensive which has given the Central Powers no little concern. To be sure, this flank of the Russian line was less severely dealt with by the Teuton drives; the Slav armies farther north, against which Germany's mightiest blows were delivered, while they bravely stood up under those blows, have not sufficiently recuperated to be a menace to their enemies. The month's reports indicate that nothing except minor local actions are taking place in the vicinity of Riga, while the Dvinsk sector, so well defended against von Hindenburg's assaults, is now quietest of all.

Roughly speaking, the Russians seem to be endeavoring to repeat their early successes of the war in this region, and to be advancing along two main lines,—first, by way of the Odessa-Czernowitz-Lemberg railroad; second, farther north along the Kiev-Kovel-Warsaw line. In the first region, their efforts have centered on capturing the Bukowinan capital, which has already changed hands five times in the course of the war. Farther north, the Russian objective appears to have been to drive a wedge into the Teutons' lines near Czartorysk, toward Kovel, and flanking the strong

fortresses of Lutsk and Dubno on the one side, and the town of Pinsk on the other.

The attacks upon Czernowitz have been numerous and desperate, at one stage the Russians having been reported to have used 60,000 men and 200 guns on a one-mile front. So far, the city has resisted capture, though some neighboring hills were reported taken, together with some thousands of Austrian prisoners. Toporoutz and Sadagora, some miles northeast of the capital, have also been bloody battle-fields, where costly Russian attacks have been repulsed. In the desperate fighting fifty miles north of here near Buczac, the reports, in speaking of the advance of the Russians as far as the wire entanglements, emphasize the growing similarity of conditions here to the fortified lines on the Western front. Tarnopol, 25 miles north of Buczac, is the chief strategic center in this neighborhood, on account of its control of the traffic routes of Eastern Galicia.

In the heavy fighting throughout this region the Austro-Hungarian troops are showing much better fighting qualities than they exhibited earlier in the war.

Considering this great Russian offensive, which began on Dec 24 as one long battle on a front of over eighty miles, the net result seems to be, weighing the conflicting reports, that each side occupies almost its original lines, with slight advances by the Russians. In the fighting along the middle Strypa, the Russians claim to have driven the enemy back to the west side of the river.

In several of the Russian assaults against Czernowitz, the formations are said to have been from twelve to fourteen lines deep. Both shells and small arms used in these attacks are reported to be very largely of Japanese manufacture. In the late fighting in these sectors 5100 Russian prisoners have been taken.

Jan

The other main Russian movement concerns the region of the Styr River. Early in January the Russians succeeded in crossing this strong defensive line north of the Kovel-Sarny railroad, and in holding on to their position. Thereupon the village of Czartorysk became a storm center, and was finally captured by the Russians by assault. This advantage, however, and a local success at Kuchochawola, 25 miles farther north, do not appear to have been vigorously followed up, although one report (Jan 26) claims a successful advance to within three miles of Pinsk.

The Russian offensive on the eastern front, which commenced with such vigor in December, has been apparently a sporadic affair. After successive days without reports of any significance, a despatch suddenly announces that Czernowitz is threatened again, or that the Russians are advancing again in the Volhynia "triangle." It is, perhaps, not difficult to stop the Russians, but they do not easily stay stopped. Their attacks on Czernowitz renewed with intensity the last week in January, northeast and southeast of the city. "At Ranancze, south of Toporoutz, they captured

**EUROPEAN WAR—Continued**

and held one sector against five desperate Austrian counter attacks, which broke down with severe casualties."

*Feb*

On Feb 11 they were reported to have made progress in the Lutsk-Rovno-Dubno triangle by capturing the heights east of Tchemerine. The reports at this time claimed further Russian successes on the Galician front. The Germans, it is said, are on the defensive on the Pruth, the Dniester, and the Sereth, and Russian advances are reported at several places in this region. Of these, the most important is the capture on the Bukowina front of Uscieczko, "a position of great natural and artificial strength on a high ridge between the Dniester and its tributary, the Zurin. The Russian attack had such tremendous impetus that in addition to capturing the extensive fortifications, they pushed on, and crossing the Dniester, seized the high bank on the opposite side as well. This success again threatens the Austrian position at Czernowitz, the capital of Bukowina."

Even if these Russian assaults have gained little of strategic importance, their effect has at least been to prevent the withdrawal of Teuton forces for needed purposes elsewhere.

Farther north, on the other hand, the initiative is in German hands. There has been renewed activity against Dvinsk; so far, however, Russian artillery has been able to disperse the German attacking columns. Moreover, "the mild weather of the past month, threatening with inundation the trenches built by the Germans on marshy ground, is seriously handicapping their effort to move forward." Bomb fighting and artillery duels in this region, as also around Riga, have been of occasional occurrence.

"The Pinsk marsh region has had a sudden thaw, with serious results for the Germans, who have lost large quantities of ordnance and some men in the marshy labyrinth."

A serious mutiny is reported (Feb 15) to have broken out in the Twelfth German Army, near Vilna. This important city has been reported in flames.

*March*

Beside Verdun and Armenia, other theaters of war seem insignificant this month in their contribution to the story of the war. Only occasionally has news of importance come from Russia, as when an attack on the German lines near Postavy, 50 miles south of Dvinsk, appeared to be a serious attempt to relieve the pressure on the French at Verdun. These attacks, which began Mar 17, were repulsed, the Germans claim, with great loss.

Mining operations are of increasing frequency on this front. At Illuxt five German blockhouses were destroyed by Russian mines, and the battle for the possession of the craters was waged desperately for days. In this battle, the Germans used aerial torpedoes of large caliber.

On Mar 21 was reported the capture by the Russians of the bridgehead at Uscieczko on the Dniester, guarded by the Austrians for

six months. The garrison is reported to have escaped.

The veteran General Kuropatkin has been recently assigned to command the Russian northern armies.

*April*

Operations in Russia at this time of year are interfered with by the thawing of the marshes and breaking up of ice in the rivers. This fact has made both sides desirous of obtaining the higher, more favorably located positions.

The Russian offensive in the extreme north, which developed the last ten days in March, was directed against the bridgehead at Jacobstadt and the railroad west from there toward Mitau. Petrograd reported that this attack penetrated the German lines for a short distance; Berlin claimed that all the assaulting columns were repulsed with heavy losses.

South of Dvinsk, in the region of Lake Narocz, the Russians fared no better. Here their objective was the town of Sventziany, on the Vilna-Dvinsk railroad, some 25 miles distant; near Postavy they made several desperate attacks. On a small section of this front, over 50,000 shells are reported to have fallen in a day. Despite some local successes, and the capture of 1200 men, the Russians were thrown back with extremely heavy losses. In front of the German positions at Lake Narocz, over 9000 dead Russians were counted.

In the later fighting in the north, the Germans have for the most part assumed the initiative.

To the south, no noteworthy success has been achieved since the capture of the Uscieczko bridgehead by the Russians, reported last month. The garrison, which had resisted the Russians for six months, when forced to retire, though outnumbered (it is reported) 8 to 1, successfully cut its way out through the investing troops.

"Aircraft have been active. Southwest of Dvinsk a Russian aviator brought down a German dirigible, and a Russian aircraft of the Mourometz type threw many bombs on German camps below Riga. Four German naval planes attacked the Russian aerodrome at Pappensholm, on Oesel Island, at the entrance to the Gulf of Riga, and forced down 2 out of 4 Russian planes which rose in defense. Twenty bombs were dropped.

*May*

The paucity of news from this quarter indicates that both Germans and Russians are content to hold the line thinly, their main strength being elsewhere. The only action of considerable magnitude reported for the entire front was a battle fought in the Lake Narocz sector, which resulted in Russian defeat, with the loss of 5600 men, guns, etc. This seemed to mark definitely the conclusion of the great Russian spring campaign.

*May 20-June 20*

The preparations for the great Russian offensive had begun in April, when General A. A. Brussiloff, a brilliant cavalry officer, succeeded General Ivanoff in command of

the Southern armies, and expelled all newspaper correspondents from his command. Since last fall there had been little change in the alignment on the eastern front, the northern end of which, from Riga to the Pripet, was held by the Germans, estimated at 1,200,000 strong, while the southern end, to the Rumanian frontier, was occupied by the Austrians, probably not over 700,000 in number. This line heavily fortified, was supposed to be so strong that the Austrians had removed to other fields the reserves that would ordinarily be held in rear.

Brussiloff's offensive was timed so that the attack of the various Russian columns began simultaneously. Thus there was no chance for the Austrian units to reinforce one another. After an overwhelming storm of artillery fire, the Russian infantry assaulted in their favorite deep attacking columns, wave following close upon wave, as it seemed to the *Berliner Tageblatt's* correspondent. The Austrian first line made a fairly good resistance, but after that was broken, the Austrians seemed completely demoralized, and surrendered in droves. In following up the retreating enemy, General Brussiloff made excellent use of his cavalry, the Cossacks doing brilliant work in cutting off detached commands of infantry and artillery.

The advance of the Russians followed much the same lines as their first offensive in this region early in the war. Their general directions of attack were northwest from Rovno toward Kovel, with Lutsk as a first objective; west along the Rovno-Lemberg railroad, with Dubno the aiming-point; northwest from Tarnopol along the railroad toward Lemberg; and south across the Pruth, with Czernowitz as the objective.

The first important stronghold to be gained was Lutsk, which the Austrians abandoned on June 6, after a brief rear-guard action. This is the most westerly of the Volhynian triangle of forts, the possession of which has been so often disputed during this war. On June 10 the Russians captured the remaining fortress at Dubno (Rovno they had never lost), and with it 35,000 men and 30 guns. On the same day, Buczac, and Potok Zloty, farther south on the Strycz, were both entered, and many additional prisoners taken. By this time the defense had stiffened all along the line from Tarnopol north to Kolki; Russian forces which had crossed the Styr north and south of Lutsk were sharply attacked at several points by Austrian and German troops, and the rapid Russian advance was somewhat checked. Northeast of Buczac, a combined Austro-German attack succeeded in definitely halting the Russian advance at this point.

Meanwhile in Bukovina, progress had been somewhat slower. The Austrians had met their greatest reverse at Dobronovtze, near the frontier, where they had lost 18,000 prisoners and 10 guns. By June 14 the Russians were in command of the north bank of the Pruth opposite Czernowitz, over a thirty mile front. The Bukovinian capital was doomed, but the Austrians, loath to relinquish it, vigor-

ously disputed the passage of the river. On the afternoon of June 17, General Lechnitskys' forces carried the bridgehead by storm, and that night entered the city, at last abandoned by the Austrians. General Pflanzer's southern Austrian army is by this defeat partially cut off from the northern armies, having only roundabout communications through the Carpathians, and is in no little danger of capture. Czernowitz has been thrice before evacuated by the Austrians. Besides the tactical advantage of its capture to Russia, there is the political effect to consider, that Rumania may be influenced to side with the Allies.

At no point have the Russians advanced more than thirty or forty miles. Their gain in territory is perhaps less significant than their gain in men. The former may be lost and won again, but a loss of 170,000 prisoners (claimed taken by the Russians between June 4 and 15) is irreparable. At present the Russian advance has reached a point some 20 miles east of Kovel, and toward Lemberg as far as the line of Zlota Lipa River. Their progress is being vigorously contested at every point, but the results of this second stage of the fighting remain to be seen.

Along the northern Russian lines, the Germans have recently developed a number of minor attacks, but nowhere in such strength as to compel any redistribution of Russian forces.

June 20-July 20

"The Russian attack between the Pripet and the Pruth," says the *Army and Navy Journal*, "was the greatest and finest military effort ever made by that empire."

The close of the last period, June 20, found the Austrian defense in the Kovel sector materially strengthened. This was due primarily to the arrival of some 200,000 German reinforcements under General von Linsingen. These were thrown against the Russian columns advancing west and northwest of Lutsk, and gained important advantages at Kiselin, Lokatchi, and other places. In the period June 16-25, 11,000 Russians were captured in this sector. Russian advance was definitely checked at the line of the Stokhod River, 20 miles from Kovel.

Similarly the advance toward Lemberg was halted at Brody, on the Galician frontier. Further south, however, the Russians suffered no such reverse. After the capture of Czernowitz, the Russians proceeded to overrun Bukovina for the third time during the war. A rapid advance down the railroad to Radautz cut in two the Austrian columns that were retreating and secured a thousand prisoners. West from Czernowitz, along the Pruth, the advance encountered more opposition, but on July 1 the railroad junction of Kolomea was entered, and shortly afterwards the railroad running south from Lemberg over the Kirlibaba Pass into Hungary was cut at Delatyn. This gave the Russians a position threatening the flank of the Austrian line to the north.

Meanwhile, the Russians had resumed their attacks in the Kovel sector. During the first

**EUROPEAN WAR—Continued**

week in July, they made important gains at the point where their line first bulges to the west, along the Czeretorysk-Kolki front. Once more they surged forward toward Kovel, crossing the Stokhod River at Ugli on July 8, and holding the west bank. It is interesting to note that the Russians in making this crossing are reported to have made successful use of ponton bridges built under cover and swung into place—the "method of conversion" described in the text-books, but scarcely used since the classic example of Napoleon at Lobau. This river is the last natural barrier in front of Kovel, and von Linsingen's army is making desperate attempts to hold it against the Russian columns under Generals Kaledines and Lesch.

Somewhat farther south, at Sviniuskv. the Russians gained a notable victory on July 16, capturing 13,000 men and 30 guns. The success of the Russians in following up their victories is said to be due in part to armored motor cars driven by British and Belgians transferred from the western front. A reason given for the large number of prisoners is their manner of employing the artillery: "First the fire is directed upon the front trenches until these become untenable; then the guns are elevated so that an impassable curtain of fire is thrown behind the positions about to be evacuated and the Austrians thus caught between two fires have no option but surrender."

Although the fighting in the Tarnopol region has been much less severe, the Teutonic armies under the command of General von Bothner, on account of the Russian advances to the north and south, have been compelled to withdraw from all the region east of the Zlota Lipa River.

In Bukovina, the Austrians still offer some resistance, where they are struggling to hold a line close to the southern border. Indecisive actions have been fought near Kimpolung in this region. Some of the remainder of General Pflanzer's command have been forced over the Rumanian border, and there interned.

Under General Brussiloff, it was to be expected that the cavalry should have full scope for their activities. Of late, the mounted arm has been used directly against the trenches, according to the German despatches.

"When there is a wide open space to cross exposed to German fire, the Cossacks gallop forward as far as possible, then stop their horses and make them lie down, as they are trained to do at command. While the Cossacks, using their horses as breastworks, keep up a rifle fire at the trenches, the Russian infantry run up to them and then charge the entrenchments beyond."

Further proof of Russia's renewed strength is abundantly supplied by her operations in the north. Here was a chance for von Hindenburg to relieve the pressure on the southern Teutonic armies by an offensive against Kuropatkin's forces. But it was the Russians who attacked, the second week in July, opening upon the German lines near Riga with a heavy

deluge of shell. So far, von Hindenburg's left flank has held its ground against the energetic attacks of the Russians.

Still another scene of active fighting has been Baranovich, an important railroad crossing between Vilna and Pinsk. Desperate Russian assaults have failed to dislodge the Germans here. Farther north, there have been minor indecisive engagements in the Smorgon region, east of Vilna.

Late despatches report that raiding parties of Cossacks have crossed the Carpathians into Hungary, but there are no indications of a serious invasion across the mountains.

*July 20-Aug 20*

In some ways, the Russian ability to "come back" has been one of the biggest achievements of the war. German correspondents have repeatedly expressed their "amazement," and marvelled at the apparently inexhaustible supply of men and munitions. The *Army and Navy Journal*, speaking of "Austria's collapse," lays the blame of her failure partly on the poor reconnaissance that failed to detect the tremendous massing of men and supplies behind Brussiloff's lines.

The failure of Kuropatkin's attack in the Riga sector has already been noted. Its initial successes, which attracted much attention, were due to the effective co-operation of the navy, which allowed the Russians to seize the German positions along the coast for about 20 miles west of Riga. Russian attacks along the Dvina, on the other hand, failed to gain the west bank of the river, except in one spot.

While progress toward Kovel, in the Volhynian sector, has been slow, the Russians under General Sakharoff have taken many prisoners in this region. In a series of actions near Beresteck on the Styr, the last week in July, the Austrians were forced back with a loss of 1600 prisoners, including one entire regiment of Landwehr. Again on July 27, a victory somewhere west of Lutsk resulted, according to Russian reports, in the capture of 30,000 men and two generals. For the rest, Russian effort in this direction has been content to conquer the barrier of the Stokhod River. This has now been crossed in at least three places,—at Gulevichi, on the Kovel-Sarny railroad, near Tristyn to the south, and about 50 miles to the northeast, near Lubieszow. Working south from Gulevichi, the Russians seem to have gained the entire tongue of land in the bend of the Stokhod. At another point, near Stobychva, thirty miles to the northeast, another crossing was won, but subsequently lost, with 2000 prisoners; in this case the Germans made effective use of sunken barbed wire entanglements.

Here the advance upon Kovel has practically halted. The capture either of Kovel or Lemberg would be a sufficient menace to the Austro-German line to compel its general retirement. It has seemed as if the Russians, encouraged by their advances in the south, and showing extraordinary ability to shift objectives, had concentrated upon Lemberg. The latter city, to be sure, is considerably farther from the nearest Russian army than Kovel;

but the more rapid advance in the south bids fair to flank the Austrians out of it. Progress toward this goal from the direction of Dubno and Tarnopol has been slow. Dubno, just across the Galician boundary on the railroad, and 58 miles from Lemberg, was entered by the Russians on July 28, after severe fighting in the vicinity. West from Tarnopol the Russian lines have hardly advanced a score of miles. But farther south, seriously checked, and has been remarkably General Letchitsky's advance has not been successful. The Austrians, while their retreat is being well conducted, have offered resistance only at fortified lines and river crossings, and have made no attempt to hold the cities. Thus the important center of Stanislaw fell an easy prey to the Russians on Aug. 10; about 15,000 Austrians were captured in the vicinity. The line of the Zlota Lipa has been passed; Halicz, the southern gateway to Lemberg, is but seven miles distant, and the farthest point of Russian advance is already on the same meridian as Lemberg.

Still farther south, amid the Carpathians, Russian success has also been notable. Altho the Austrians, under Archduke Karl, have gained more minor successes, these are more than offset by the Russian occupation of Jablonitz, commanding the mountain pass into Hungary, with the only railroad-crossing in this whole sector. The Russians have already passed thru this opening, appearing on the heights beyond, but without indicating any intention of a serious invasion.

#### Sept

Russia's campaign against Lemberg is following very closely the lines of the successful offensive two years ago. At that time, the same Brusiloff, then in command of the Russian left flank, succeeded in crossing the Zlota Lipa near the Dniester, and rolled up the Austrian flanks by sending his Cossacks on a rapid northward march. In the rout that followed, 64,000 prisoners were taken, and Lemberg was left undefended.

In a general way, the attempt is being made to repeat these same tactics. The more direct advance is being made from the direction of Brody and Brzezany. At this latter place the fighting was especially severe the first week in September. But the more dangerous assaults have been made further south. The lines of the Strypa and the Zlota Lipa have been successively turned and rendered untenable. Only the Gnila Lipa line remains in front of Lemberg. After the capture of Stanislaw by the southern wing of Brusiloff's army, Halicz became the next objective. Around this city, the "southern gateway to Lemberg," the fighting has raged since the Russian offensive was resumed on Aug. 31. It has been bombarded and partly burned; an effort to encircle it on the north was frustrated by Count von Bothmer's skilful defense at Burshtyn; once it was reported fallen, but incorrectly. The attacking forces continued to make progress until Sept 18, when Gen. von Gevok's successful counter-stroke, with the co-operation of Ottoman troops, resulted in a

serious check to the Russians. The latter had to relinquish their recent gains, and suffered heavy casualties in addition to the 4200 captured.

Farther north, on the Kovel-Vladimir Volynsky front, no progress whatever is reported for the Russians. Rather, they have been hard put to it to hold the line of the Stokhod in the face of determined German attacks, which have not been altogether unsuccessful. Only on Sept 17 did the Russians take the offensive in a series of heavy attacks along a twelve-mile front near Zaturze. The successive assaulting lines were repelled with heavy losses.

The outpost actions along the Dvina in the far north call for but scant mention. The Carpathian region, however, is assuming an increased importance. Austrians and Russians are both striving to secure the passes and vantage points in the mountains before the severe weather sets in. There has been a particularly bitter conflict for the possession of Kapul Mountain, some twenty miles west of Kimpolung, in southern Bukovina. The Archduke Charles has prevented the Russians from making any considerable advances along this front.

#### Oct

After a period of comparative quiet, the cry of "On to Lemberg" was taken up again the first of October by General Brusiloff's columns. Russian attacks developed along the railroad near Brody, south of Brzezany on the Zlota Lipa—in fact, all along the 125-mile line from Lutsk south to Halicz. These attacks reached their height about Oct 6; the Germans reported the artillery preparation as "extraordinarily intense," and the charges were repeated as many as seventeen times in one day. According to the same account, Russian artillery was in one case turned upon their own trenches, in order to force the troops forward.

These tremendous efforts resulted in no material progress, although both sides claim minor gains, and the capture of many prisoners. German methods are apparent in the active defensive measures taken; and the importance attached to this theater is indicated by a recent visit of the Kaiser to the front.

In connection with some unsuccessful German attacks against the Russians' lines near Riga, an interesting incident is the report of the use of Turkish troops in that region—surely the "farthest North" for these Mohammedans.

The renewal of the Lemberg campaign may have been undertaken, partly to serve as a screen for the Russian operations in the Carpathians. The reports indicate no little activity along this front. Several local successes were reported for the Russians, including the capture of Panther Pass. Toward the close of the period, however, a strong Teuton offensive, developing near the Bukovina-Rumania-Transylvania corner, bid fair to offset these gains and drive a wedge between Rumanian and Russian allies.

**EUROPEAN WAR—Continued**

What activity has been maintained along the Russian front has been, for the most part, on a small scale,—as if to distract attention from the more important fighting taking place further south. The Germans have generally been the aggressors in these attacks. Particularly along the Stokhod, on the Narayuvke (near Halicz), and at Skrobowa (near Baranovich) have the Germans sought with some success to improve their positions. At the latter place, seven successive assaults over a  $2\frac{1}{2}$  mile front were repulsed. On the eighth charge, the Russian front was broken, and the defenders forced to give up their strong front line of fortifications, with a loss of over 4000 prisoners. A Russian bridgehead on the Stokhod was taken, and the German position at Halicz, in front of Lemberg, made more secure than ever.

Turkish troops have been active on the Galician front, and have claimed some successes near Molohov.

Fighting continues in the Carpathians, which are now covered with snow. The contests have centered particularly about Dorna Watra and Kirlibaba and the adjacent passes, with indecisive results.

*See also*

TANNENBERG AND ANGERBERG, BATTLES OF

**THE SOUTHERN THEATER**

In a war where sieges of short duration have been the rule, the siege operations about Goritzia have been especially noteworthy. For weeks the target of deadly bombardments, its surrounding heights subjected to assault upon assault, the city has continued to resist capture. One reason for its successful resistance is found in the natural strength of the position, with the intervening river, and the steep neighboring heights,—Podgora just to the west across the Isonzo, Oslavia two or three miles to the north, and the Carso Plateau some eight miles south-west. No doubt the character of the defenses is another point in the city's favor; there is little concrete about these fortifications, which are mostly inconspicuous earthworks formed into terraces.

The assaults on the city, continued for weeks, reached their climax early in December, when for nine days and nights the attacks were continued unceasingly near Oslavia, and heaps of bodies left in front of the position. Efforts to capture Podgora Heights met with a like result. Bombardments caused widespread damage to the city, and killed several hundred civilians, but, according to the Austrians, left their military positions intact. After this supreme effort, the Italian offensive inevitably slackened. Its fury has exhausted itself, though the defenders must still be on their guard to resist attacks. The Austrians estimate the Italian attacking force to have comprised seven divisions, and to have lost 75,000 men.

Elsewhere, too, the Italians have made little progress. The Tolmino bridgehead, the heights of San Michele and San Martino on the Carso Plateau, and other key positions,

resist capture; the road to Trieste is still effectively blocked. The Italians, to be sure, have successfully resisted Austrian counter-attacks on their position; and in a surprise attack, have recently gained a trench on Monte San Michele, with 115 prisoners.

The mountain warfare in the Trentino has been scarcely more than a series of outpost actions during the last month. It must be borne in mind that there is scant promise of successful invasion along the narrow valley of the Adige, and that Italian efforts here are directed toward safeguarding her main offensive on the Isonzo. It seems worth while to mention a successful attack by Italian infantry in the Gindicaria Valley (10 miles west of Lake Garda). Assaults with the bayonet carried successive lines of trenches, and finally the redoubts crowning them on the peaks of Mts. Viesdos and Mascis.

Air raids by the aeroplanes and seaplanes of both contestants have been frequent. The Italian air service now includes a number of the new type of giant aeroplanes with a wing spread of over thirty yards and carrying three machine guns.

"From North Africa the news continues to be very unfavorable to the Italians, who have suffered a severe defeat at the hands of the Senussi tribesmen and Tripolitarians, who have occupied the whole vilayet of Tripoli. The Italian losses here are said to reach several thousand men killed. A large quantity of arms and ammunition was abandoned."

The Austro-Italian sector is one where comparative quiet prevails. While the offensive remains with the Italians, their attacks are minor local affairs, accompanied by considerable artillery activity. On the Isonzo line, Malborghetto, Gradisca, Monfalcone, the bridgeheads at Tolmino and Gorizia have all been targets for heavy bombardments from the Italians. Add to this an occasional aeroplane raid by either Austrian or Italian airmen, and the fighting is largely described.

In the Gorizia sector, a successful Austrian attack against an Italian position at Oslavia resulted in the capture of 900 men. After a bitter struggle, infantry counter-attacks and concentrated artillery fire won back this position entirely.

Semi-official Italian reports give the total Italian losses up to Dec 31 as 134,500, distributed as follows: Killed, 31,000; wounded, 94,000; missing, 5000; prisoners, 4500. The total number engaged is estimated at 1,000,000.

*Feb*

Austrian initiative was responsible, during the first week in February, for a victory over the Italians on the Isonzo front. Under cover of a thick fog, a strong force attacked the heights about Oslavia, northwest of Gorizia, captured 1200 men and some first-line trenches. Strong counter attacks prevented the assaulting force from reaching the second line.

For the rest, there is little of significance in the reports of artillery duels, patrolling, and the exertions incident to operations in the snow-covered mountains of the Trentino. The

middle of February, however, has marked a somewhat increased activity on both sides.

The visit of Premier Briand to Italy, in the interest of greater unity among the Entente Allies, was made the occasion of an Austrian air raid against Milan (Feb 14), in which six civilians were killed.

On Jan 29 the Italian Minister of War issued the first cumulative statement of Italian military operations for the eight months since the nation declared war on Austria, May 23, 1915. After enumerating in detail the progress made in the various sectors, the statement continues:

"Along the entire front the enemy is at the mercy of our initiative, forced to limit himself to a passive resistance, desperately clinging to the land and to the hope that, through his superior positions, he may be able to sustain himself. The fact is, however, that while thus occupying favorable defensive positions, he has lost 30,000 prisoners, 5 heavy guns, 65 machine guns, several thousand rifles and grenades, munitions, and other war material of every kind.

"Against him, our army, facing the serious difficulties of conducting an offensive which modern war has developed, is obliged to fight always from lower positions in order to dominate the enemy's, which had been prepared for this eventuality, and in eight months of hard struggle has maintained an unaltered offensive with spirit and tenacity in the most difficult of all the present theaters of the war . . . has increased the defenses of the nation for the future, and has measurably expanded its boundaries."

#### March

The operations on the Austro-Italian front have consisted largely of artillery duels and small infantry combats. Weather conditions in the mountains have been extremely unfavorable, but have not prevented some sharp skirmishes between hostile outposts. The Austrians have not failed to assume the offensive on more than one occasion, and as this period closes (Mar 22) are making progress at the Tolmino bridgehead.

#### April

Although the month has brought forth increased activity on the Austro-Italian front, the onlooker can hardly call the result other than a draw. Fully as often as their opponents, the Austrians have taken the initiative in attacks yielding small gains, especially in the region of Gorizia, about Podgora Heights. Near the Tolmino bridgehead, they captured an Italian position and with it 925 men. In the Trentino, also, a severe battle near Borgo resulted in the defeat of the Italians with a loss of 600 prisoners.

The Italians, for their part, have made minor gains, notably on the Carso Plateau, just northwest of Monfalcone, (afterwards recaptured) and in the Ledro Valley towards Monte Sperone. One action, that resulted in the capture of Austrian outposts near Mt. Adamello, on the western boundary of the Trentino, was fought at an elevation of 3300 meters.

Aircraft of both nations have been active,

in the vicinity of Trieste and about Lake Garda.

#### May

Late in April there came from Rome reports of large concentration of Austrian troops in the Tyrol. Two weeks later, after an interval characterized by the usual reports of minor activities, this news was suddenly confirmed. The Austrians had at last assumed the offensive. Southward from Rovereto they had struck, and struck hard, on May 15. On this day, attacking over a front some twenty-three miles long and stretching north-east from a point three miles south of Rovereto, the Austrians captured Italian trenches on Armentara Ridge, in the southern Sugana Valley, on Folgaria Plateau, and south of Rovereto. The next day these were followed up with other important gains, reaching to a point close to the frontier, and offsetting the slight Italian gains of many months. In two days 6200 prisoners were taken. A very thorough artillery preparation contributed largely to these successes. The offensive thus begun promises to be one of considerable magnitude, and is apparently aimed at the important junction city of Vicenza, some 40 miles to the southeast.

This new Austrian offensive was marked by increased activity on the part of the Austrians all along the line. East of Monfalcone and west of San Martino, in particular, they gained minor successes.

#### May 20-June 20

The Italians admit that the Austrian offensive in the Tirol took them entirely by surprise, despite the fact that the concentration for the drive had been going on since early in the spring. The Austrians had massed in the mountains, according to Italian estimates, some 600,000 men, and 3000 guns, some of them of large caliber. Many of the troops had been brought from Serbia and Galicia; further evidence of the lessened importance attached to the Balkans is found in the Italian report of Bulgar prisoners taken on the Isonzo front.

It seems probable that when the first Italian attempts to push their way up into the Tirol toward Trent and Rovereto were halted, the real Italian strength was concentrated along the Isonzo front, and the forces in the Trentino were simply guards left to protect the rear of the Italian main army. In any event, these Italian columns, in the months of mountain fighting, had been able to penetrate only a short distance, not over five miles, into Austrian territory, a gain which was swept away from them in the first few days of Austrian advance. Strong defensive positions, like the Zugna Torta on the east side of Lake Garda, were abandoned after a two or three days' bombardment, with little real opposition. So quickly had the Austrians swept aside the Italian outposts and changed their rôle from defensive, that the Italian people were roused as never before to the need of desperate fighting.

It soon developed that the Austrian movement down the valley of the Adige was of

**EUROPEAN WAR—Continued**

minor importance, the real strength of the Austrians developing between the Astico and Brenta Rivers, toward the Italian towns of Arsiero and Asiago. These towns, with Schio and Posina, form a line some ten miles within the frontier, strongly guarded by fortified hills, the first strong defensive position prepared by the Italians. Twenty miles beyond the screen to the southeast lies Vicenza, and some forty miles further is Venice. The Austrian soldiers had been promised the chance to bathe this summer at the fashionable beaches of this city on the Adriatic.

On May 31, two weeks after the campaign opened, the Austrians had captured 30,000 Italians and 300 guns. They had penetrated several miles into Italian territory, and were contesting the possession of the fortified hills that dominate Arsiero and Asiago. The Russian offensive, which commenced soon after this, came at a very opportune time for the Italians. The strain of meeting this unexpected attack on the Russian front soon resulted in a slackening of the drive into Italy. Even so, the Austrians had gained positions on the hills two or three miles northeast of Arsiero and an equal distance south of Asiago, that menaced those two cities. Their 38 cm. guns have been brought to bear upon these towns, and the inhabitants have fled to the interior. Except for the Russian diversion, Austrian progress would probably have been much more considerable. As it is, the Italians have had time to strengthen their defensive line, their resistance has stiffened greatly, and there is reason to expect another long pause on this frontier.

On the Isonzo front, there has been little except outpost skirmishes since early in June, when there was some severe fighting in the Monte Nero zone. An Austrian column penetrated the Italian lines in a night attack, only to be expelled later by fresh Italian troops. At Monfalcone the artillery has been active; while air raids continue all through this region.

• *June 20-July 20*

Italy has made a fresh start. With a new ministry under Premier Boselli, with the incompetent General Brusati removed, the Italian Alpine army caught its breath and started in to retrieve the losses which Austria had so unexpectedly inflicted. The climax of the Austrian offensive came with the occupation of the Italian fortified towns Asiago and Arsiero, some ten miles across the Italian frontier on the route to Vicenza. Austrian success had been in large part due to her employment of some 2000 guns, among which were 60 of the 30.5 cm. Skoda howitzers which have played such an important part in the war. Now, late in June, Italy started her offensive with strengthened forces and with a new spirit. Concentrating 700 guns on Mount Cengio, a peak 4500 feet high overlooking the Astico River, near Arsiero, the Italians kept up a three days' bombardment. Finally, on June 25, the Austrians abandoned their lines and retreated up the narrow valley in

what was described as a rout. Their retirement, on the whole, has been gradual, however, and they are still on the Italian side of the line. Italy finds it slow, dogged work to win back the positions lost so quickly.

After a period of inactivity on the Isonzo front, the Italians renewed their offensive late in June by vigorous attacks at Gorizia and along the Carso Plateau. Austrian trenches were taken and held against strong counterattacks.

Powerful air fleets on both sides have been active. On June 25, Italian warships are reported to have entered Durazzo roadstead and sunk two steamships loaded with munitions.

*July 20-Aug 20*

Italy has "done her bit," or is doing it. The attack upon Gorizia was well timed, and was pushed home with vigor and enthusiasm. Of the fortified heights that protected the city, Podgora, directly across the Isonzo, was already in Italian hands; but San Sabotino, on the north and San Michele, on the south, had resisted every assault. This new offensive was preceded by a particularly violent artillery preparation, the infantry advance following on Aug 6. Under the exposed approaches to Sabotino Mountain, three wide tunnels had been dug, and the trenches thus made accessible were readily stormed. The forcing of the stream was costly in men; but the Austrian defense, once penetrated, speedily collapsed, and by Aug 9 the prize was taken. About 15,000 men were captured with the city.

The fall of Gorizia is being vigorously followed up, and the Italians have not been slow in spreading out to the east and south toward Trieste. In that direction stretches the long Carso Plateau; the roads to Trieste traverse valleys commanded by overhanging heights, and good positions are available for the Austrians to dispute the Italian advance. By Aug 12 the Italians had reached a point six miles south of Gorizia, and taken several villages and hills, each with its quota of prisoners. Another independent detachment had attacked the Austrian lines near Monfalcone, on Aug 4, and had made notable progress on the Carso Plateau. This column was now in a position to co-operate with the Gorizia army.

Meanwhile, the campaign in the Trentino had become of minor importance. The initiative remained at first largely with the Italians, but with an increasing number of Austrian counter offensives. No successes of importance were achieved.

*Sept*

The capture of Gorizia has proved to be only the initial step of the campaign against Trieste. Beyond the Isonzo, the Italians encountered fresh obstacles, and the period of comparative inactivity that followed after the fall of Gorizia gave the Austrians time to strengthen the natural defenses of the terrain. Chief among the obstacles in the twenty miles that separate the Italians from this goal is the rugged Carso Plateau, for the most part of bare rock, devoid of vegetation. These heights, close by the sea, frown



down upon the railroad and roads that lead toward Trieste, hugging the shore.

After the initial attempts to advance were checked, little further progress was made until Sept 14, when the Italians resumed the offensive, armed, it is reported, with 100 new 305 mm. guns. The net results of the next few days' fighting were the capture of San Grado, several lines of trenches toward Loquizza and south of the Wippach river, and 3000 prisoners.

In the Tyrol, the campaign initiated by the Austrians and reversed by the Italians, still has its aftermath of local conflicts. Elsewhere in the Dolomites, along the northern part of the Isonzo, matters are much as they have existed for a twelvemonth.

*Oct*

The Italian attacks of Oct 10 and 11 on the Carso seem to have surprised the Austrians by their suddenness. A heavy bombardment had preceded the assaults, which won Villa Nova and part of Hill 208, together with 5000 prisoners. The Austrians, however, claim to have captured 1400 Italians in the counter-attacks which followed. Novavas has since been captured by General Cadorna's troops, who are making headway in this difficult region. The Austrian defensive forces, estimated at 100,000, are reported to have been recently reinforced. The Austrians estimate that the Italians have brought into action on the Carso front 20 brigades of infantry, a division of cavalry, and 15 Bersagliere battalions.

In the Trentino there has been more activity than at any time since last summer. The numerous encounters in the valleys and among the peaks are interspersed occasionally with battles on a large scale. The results of none of these, however, have been particularly decisive or significant.

In judging the present progress of the Italian armies, it must be considered that Italy has now contributed troops to General Sarraïl's army, and her forces are now represented in Macedonia, as well as in Albania.

*Nov*

The Italian offensive which began early in November was the most considerable effort made since the fall of Gorizia. As on previous occasions, its suddenness seems to have caught the Austrians off their guard, and the successes of the first two days were spectacular. From the western edge of the Carso, where the Italians have been held in check by the strong Austrian defenses, they struck eastward on Nov 3 against the heights that bar their advance. East of Gorizia they advanced along the railroad toward Prebaccina nearly a mile in one day. Farther south also their advance kept pace; in the narrow neck of land between the Carso and the sea they drove ahead another mile, almost to Duino, the largest town on the Gulf north of Trieste. A second day added another five-eighths of a mile up the Wippach valley; and these gains were consolidated and extended the following week, the key position of Fanti Heyb being among the later gains.

Like its predecessors, this spurt has quieted down. It may well be that the Italians have not a sufficiently large supply of shells to continue the offensive on this scale. It may be that their activities have been hampered by the heavy snowfalls and torrential rains reported from this sector. Probably they had little intention of pushing on to Trieste immediately; in any event, one desired object was achieved when Hungarian troops were called from Transylvania to the relief of the defenders of the Carso. Kaiserjaeger regiments from the Tyrol are also reported to have been sent to this theater. Most striking of all the results of this short campaign the Italians claim to have captured 39,000 Austrians.

## THE SOUTHEASTERN THEATER.

*Asia Minor*

*April*

The triumphant progress begun by the Russians at Erzerum continues unchecked. Advancing toward Trebizond along the Black Sea coast, one column had dislodged the Turks from a strongly defended position on the Kava Dere River, 12 miles east of Trebizond, by a combined land and sea attack. Meanwhile, under cover of the fleet, a strong force was landed from Russian transports west of the city. The garrison, threatened thus on both flanks, did not attempt to hold out, but evacuated the city on Apr 18. Most of their number, estimated at from 50,000 to 60,000 men, escaped toward the west and south.

Russian activity elsewhere, remarkable considering the unfavorable season of year and mountainous character of all this country, had prevented a concentration of Turkish forces for the defense of this important seaport. The column advancing west from Erzerum along the route to Erzincan has occupied Mamkhuatan, some 40 miles east of Erzincan, where Turkish reinforcements are reported to be concentrated. The force marching on Baiburt, via the Tchuruk River valley, about midway between Mamkhuatan and the coast, appears to have met the stiffest resistance; here the Turks claim to have gained an advantage after an attack persisted in for six days.

South of Bitlis the Russian advance has won them Hizan. The occupation of Sert, the next large town in this direction, will open the way to Diarbekr.

*May*

"The Grand Duke's campaign in Armenia," says the *Army and Navy Journal*, "has demonstrated that the day of rapid advances of an army in the field is not yet done. In practically the same time required by the forces commanded by the German Crown Prince to advance along a 40-mile front to the greatest depth of five miles, the Russian Army under the Grand Duke has taken ten cities from Erzerum to Trebizond, marching a distance of about 150 miles in the course of his campaign, and has seized a territory amounting to more than 10,000 square miles. The capture of Trebizond by the Russians gives them a tremendous advantage in supplying

**EUROPEAN WAR—Continued**

their troops, and this valuable base permits a direct route by sea to it from Odessa."

This success the Grand Duke is now attempting to follow up by operating with three columns against Baiburt, Erzingan, and Diarbekir, driving a three-pronged fork, as it were, into the heart of Asia-Minor. His success in keeping these widely separated troops advancing and affording each other mutual protection on the flanks, is an additional proof of his ability as a general.

The first serious opposition from the Turks was encountered in the upper Tchörük Valley, where the Russians were definitely checked. The Turks have gained minor successes, as some 50 miles east of Erzingan, and in the mountains west of Mush, on the route of the southern Russian Army. Here was fought in a snowstorm an all-day battle which resulted in the capture of 300 Russians. A local Turkish offensive has also been noted in the region of Lake Urumiah, east of Lake Van. Indeed, Turkish resistance has been stiffening all along the line. Heavy Austrian guns for the support of the Turks were landed at Smyrna, on the Mediterranean Coast 600 miles away; and late reports from Russian sources state that the Turks have received German-Austrian reinforcements of infantry, cavalry, artillery, motor cars and aeroplanes, and that a new Turkish base has been established at Kharpüt, 100 miles south of Erzingan, on the upper Euphrates.

*May 20-June 20*

From Russian sources it is stated that the Turks now have very strong forces in this theater. Certainly the reports indicate an increasing strength and aggressiveness on their part. The recapture of Mamakhatum, east of Erzingan, has already been noted. Another success is reported for them in the occupation of Bashekev, 30 miles southeast of here. The Russian columns advancing toward Baiburt and Diarbekir have also felt increasing resistance.

*June 20-July 20*

In their progress west from Erzerum, the Russians developed a resistance which became gradually stronger. Toward the end of June the Turks were able to take the offensive in the region between Erzingan and Trebizond, and their attacks along the Chörük River were so successful as to force the invaders toward the Black Sea coast. After some hard fighting in this region, the Russians finally organized their forces for a strong counter offensive. This effort was vigorously pushed in the direction of Baiburt, where the Russians took 1300 Turkish prisoners. As a result, the Turks are reported to have burned and evacuated Baiburt, and the Russians are once more advancing.

Noteworthy in this theater is the Russian success in recapturing Mush and Bitlis (Aug 25), which the Turks had won earlier in the month. This wing of the Russian forces, after being temporarily surprised and worsted, is once more holding its own. The Rus-

sian columns west of Erzingan have been rather less successful, and were compelled to give ground the first week in September before heavy attacks. In the Caucasus region further north, the Turks claim to have routed a Russian army and taken 5000 prisoners. Snow is falling in this country.

The only report of importance describes a sudden offensive move of the Russians west of Trebizond. With the co-operation of the fleet, the land forces captured several Turkish fortified positions, including the town of Petra Kala, 45 miles west of Trebizond.

*July 20-Aug 20*

Why the Turks should have given up Erzingan so easily is not clear from the reports. Closing in rapidly from several directions upon this objective, the Russian columns found the city practically abandoned, and on July 26 announced its capture. The Turks claimed to have removed most of their military stores. The next important Turkish base is Sivas, 130 miles farther west; with the fall of the stronghold of Erzingan, the route now lies open to the former city. And yet the Turks proved that they still had strong forces available, when, a few days later, they drove the Russians from Bitlis (Aug 7) and Mush (Aug 8), and continued to advance upon the passes northward. Russia, in falling back from these towns, has disclosed that her main purpose is to push west toward Constantinople; and the Turk may have been led into guessing wrong.

*The Balkans.*

At the beginning of December, the main object of the Germano-Bulgar campaign in Serbia was achieved. The Serbian army had been wiped out as a fighting force, and the entire country all but overrun by the invaders. This month has seen the completion of the work of conquest. The surviving Serb troops, fewer than 100,000 men, have been driven into Montenegro and Albania, with further captures of men and material; friendly Montenegro has been invaded and punished; the little Franco-British force in the southeastern corner of Serbia has been glad to escape into neutral soil before the enveloping thrusts of the Central Powers and the Bulgarians; and the latter have prepared themselves for offensive moves by Russia, Italy, or the strengthened French and English.

The invasion of Montenegro was undertaken by three columns of Austro-Hungarian troops, crossing the frontier north, east, and south. Plevlje and Ipek speedily fell into their hands. Advancing from Ipek to Fojoj, one column captured 6500 prisoners in two days. In the region about Bjelopolje on the Sim River, twenty miles from the Serbian frontier, some 16,000 prisoners were taken in five days of fighting. Boljamic, Jabuka, and Djakova are other towns that have been occupied by the Austrians. These advances have not been won, however, without severe opposition. Toward the end of the month, especially, Montenegrin resistance stiffened appreciably; an Austrian attack upon Touriok was repulsed, and at Bjelopolje the Mon-

tenegrins claim a victory in which they captured 100 prisoners and inflicted a loss of 2000. In the Sanjak region, also, they have assumed the offensive.

The retreat of the Serbs from Katchanik left the French left flank, on the Cerna River, in a critical position. General Sarrail promptly refused this flank, and at the same time withdrew the head of his force from the salient at Krivolac, thus shortening his line. Meanwhile the Bulgarian attacks against the Allied right were showing increasing strength. This flank was held by the British, from the west shore of Lake Doiran, northward through Valandovo to Demir-Kepu, about a ten-mile width between the flanks. The second week in December, increasing pressure from the Bulgars made necessary a general retreat. The withdrawal of the British from Lake Doiran was made possible by the gallant resistance against heavy odds of three Irish regiments; here the casualties exceeded 1500. Meanwhile the French were retreating along the Vardar, being heavily engaged and suffering severe losses. South of Gradetz, one of their battalions was annihilated by a bayonet attack.

The retreat of the Allies was skillfully conducted, and their escape into neutral territory made good. Their pursuers halted at the frontier; their dispositions are not known, but it is generally believed that a large German force is concentrated at Gievveli, just over the Serbian border and fifty miles by rail from Saloniki. The Allies have now had time to fortify their position at this base. The position is reported to be a strong one, comprising three lines of defense, its 50-mile perimeter extending from the Vardar River on the west to the Gulf of Orplanos on the east. A landing has just been made (Dec 31) at Orplanos on this Gulf, in order to guard this right flank. The Allies give every indication of intending to hold this base at all hazards. During their retreat from Serbia, the French engineers thoroughly demolished bridges, tunnels and railways,—thus furnishing one reason why the Bulgar-Teuton armies should halt their attack until lines of communication with the north could be restored.

"The widely published accounts of an attack upon the Bulgarian port of Varna, on the Black Sea, turn out to have been a gross exaggeration. The fleet of Russian warships conveying a number of transports proved to have been almost altogether imaginary. The facts seem to be that a small squadron of torpedo boats exchanged shots with the land batteries, and a Bulgarian sailing vessel was sunk by a Russian submarine. No attempt was made to land troops."

Jan

Little Montenegro has been the center of the Balkan stage during January, while the Bulgar-Teuton forces massed along the Greek border merely watched the Allies in their lines about Saloniki, 50 miles long, which are becoming ever more strongly held. French engineers had destroyed all of the bridges over which the enemy might advance,

some of the railroad bridges having been cut in defiance of Greek protests. Allied troops have even been landed at Phaleron, the port of Athens, many miles from Saloniki. Against this and other acts of the Allied visitors, the Greek king in vain made vigorous protests that the plea of military necessity did not justify such violations of Greek neutrality. Meanwhile, French and German aeroplanes were active in raiding the hostile camps.

The Austrian columns which penetrated northeastern Montenegro met with a decidedly warm reception along the Tara River and near Mojkovac. The strength of this force, under General Koevess, is estimated at 20 battalions. After desperate fighting, the Austrians forced their way to Berane, their principal objective in this eastern region.

Meanwhile, to the west, other Austrian forces had won more decisive victories. Between the Austrian naval base at Cattaro and the Montenegrin capital, Cetinje, stands Mount Lovcen, its peak in Montenegrin soil, but close to the boundary. Roads built by the Austrians at great expense up the northern slopes made the crest accessible to attack, and despite its strength, the position was taken after a three days' combined land and sea attack,—a bombardment from fleet and forts followed by an infantry assault. With this stronghold were captured 45 guns, but very few men. Cetinje, dominated by Mount Lovcen, could not now long resist capture; with it were taken 150 cannon, 10,000 rifles, and stores of ammunition. On Jan 25 was reported the occupation of Scutari, after a sharp but brief resistance; this town, near the Montenegrin border, is the most important trading center of Northern Albania.

"It seems to be a remarkable fact," says the *Army and Navy Journal*, "that a position of such great recognized strategic importance was allowed to fall without Italian co-operation with the Montenegrins in its defense. According to Italian despatches of a month ago a large expedition had been landed at Durazzo and Avlona, and it might have been expected that a first concern of such a force would have been to cover Mount Lovcen."

Later reports speak of a small Italian force said to have been engaged at Mount Lovcen.

The size and the status of this Italian expedition remain so far an uncertain quantity. Some fighting has been reported at Elbasan, some 40 miles east of Durazzo, in which Bulgarians, reorganized Serbs, Albanians and Italians may all have taken part. Elbasan is on the route of a possible advance from Durazzo inland.

A French military expedition, convoyed by warships, made a skillful landing on the island of Corfu, off the northwestern coast of Greece. Having seized the island, they are establishing a haven of refuge for the destitute Serbs, who are being brought from Albania by shiploads. French and English ships have also been landing food on the Albanian coast, to relieve the famine in that country.

**EUROPEAN WAR—Continued**

Events moved slowly in the Balkans of late. After the fall of Scutari (Jan 24), the Austrians proceeded southward along the coast, and on Jan 28 took San Giovannia di Medua, where the Allies had stored hundreds of tons of food and munitions for the use of the Montenegrins. It seemed that their contact with the Italians at Durazzo must follow very shortly. But whether on account of the difficulties of winter campaigning in such a mountainous country, or whether for political reasons, few developments have occurred. The part of northern Albania through which the Austrians are now passing is mostly inhabited by the Mirdite tribesmen, who are Catholics and bitterly hostile to both Serbs and Montenegrins. Their welcome to the Austrians is undoubtedly a friendly one. This Austrian column is estimated by the Italians at 30,000 men.

*Feb*

The Italians in Albania were reported to number on Feb 1 no less than 170,000, including 22,000 veterans from north Africa, and commanded by General Ameglio, the conqueror of Libya. Since then, an additional division has been landed. With these must be reckoned as available for the conquest of Albania the Serbs who are being recuperated and reorganized on the Island of Corfu, some 80,000, it is said, and the force of Montenegrins under Essad Pasha that retreated from Scutari before the Austrian advance. Finally, on Feb 17, according to despatches from London, the Austrians and Bulgarians having joined forces at Elbasan, east of Durazzo, the struggle for the mastery of Albania has begun. A skirmish has been reported at Tirana, ten miles north-east of Durazzo.

"Austro-Hungarian official reports confirm the statement that delegates of the Montenegrin government have signed articles regarding the laying down of the arms of the Montenegrin army. It is stated that the disarming is progressing without difficulty, and has been extended to several additional districts. All of the principal towns are securely held by the invaders and there remains no organized resistance in Montenegro."

The situation at Saloniki remains unchanged. Though the Germans have bombarded the fortifications north of the city (Feb 5), there are no evidences of an advance in force against it. On Jan 28 the Allies occupied, against the protest of the Greek garrison, the fort Kara Buritte, at the eastern entrance to the head of the Gulf of Saloniki. The numbers of the Allied troops are being constantly augmented, and the French defensive lines extend west of the Vardar River.

Enemy aircraft in the vicinity of Saloniki have exchanged visits. A French aeroplane squadron threw 200 bombs upon a Bulgarian camp near Lake Doiran, burning 500 tents and causing numerous casualties. The aviators brought back photographs of the burning camp. In return, a Zeppelin flew over Saloniki at a height of 1000 feet and dropped fifteen very large bombs, causing 60 casualties and a large property loss. Other raids have been made by

French air squadrons. The port of Durazzo has been repeatedly bombarded by Austrian aircraft.

*March*

The Austrian movements against Durazzo were vigorously pushed home. Having occupied Elbasan, Kavaia, and other towns in the vicinity with little opposition, the Austro-Hungarian troops under General Koevess moved against the port itself, capturing outside the city some 700 men. The Italian brigade which occupied the city (in lieu of the large force supposed to be there), had no thought but to embark, which they succeeded in doing (Feb 26) with some difficulty.

The Austrian advance was now directed upon Avlona, 60 miles south along the coast, the only foothold remaining to the Italians on Albanian soil. Italian outguards were encountered on the Lower Semeni River, two-thirds of the distance to Avlona, and were driven in after a brief resistance. On March 20, the Austrians were reported to have reached the front of the Italian position.

Around Saloniki, the situation remained practically unchanged. The Allies extended their lines westward to the Vardar River, and replaced several Greek garrisons by their own troops.

*April*

From the Doiran-Gievveli front north of Saloniki come reports of increasing activity. The outposts which have been content to watch each other all winter, entrenched, are beginning a feeling-out process. This position, some 30 miles north of Saloniki, is held in considerable force by French infantry and British cavalry; the Germans have been ousted from some small villages nearby. There has been heavy artillery firing on both sides.

The airmen of both opponents pay frequent visits to the enemy camps. On March 24 and April 12, fleets of 23 Allied aeroplanes raided the hostile lines near Lake Doiran, losing several planes. A squadron of German aeroplanes on March 27 flew over Saloniki and dropped heavy charges of explosives, according to the German reports. The reports do not agree as to the damage done. The Allies claim to have brought down 4 of the 7 machines.

Greece has protested against the aerial bombardment of Saloniki, but has received little satisfaction from either side. Her position as a neutral is becoming increasingly difficult, since it is now proposed to transport to Saloniki via the Greek railroads the Serbian force recuperated at the Island of Corfu.

Although the Austrians reached the vicinity of Avlona about Mar 20, no serious attack has been made on the Italian lines. The city has been subjected to aerial bombardments.

An air raid on Constantinople by three British naval officers was reported on Apr 14. All returned safely from this 300 mile flight, believed to be the longest of the war. The powder factories and aeroplane hangars were attacked with bombs.

## May

In the region of Avlona, Italian forces are reported to have occupied commanding points in the neighborhood, and to have placed heavy artillery in strong positions. During May their hydroplanes bombarded the seaport of Durazzo, while Avlona was attacked by Austrian aeroplanes.

Near Saloniki, German and French aeroplane squadrons have made several attacks on each other's camps; and on Apr 26 a battle was fought between two aerial squadrons. Along the Greco-Serb border, German troops have blown up ten bridges.

"It is believed that the German forces in the Balkans were greatly reduced and the troops sent to the Verdun front. Two divisions are known to still remain in the Vardar Gorges with about 25,000 Bulgarians and a considerable force of Austrian infantry and artillery."

## May 20-June 20

Hitherto scrupulously refraining from any violation of Greek territory, the Bulgars, on June 2, boldly crossed the frontier north of Saloniki and occupied Demir-Hissar, ten miles across the line. The Greek garrison evacuated under protest, but without resistance. At this point the frontier is formed by an almost impassable range of mountains, through which runs the Struma River by the Rupel defile. The Bulgars in this position, 25,000 in number, command the railroad running east to Constantinople, and threaten the right flank of an Allied army advancing north from Saloniki.

The French and British troops at Saloniki are supposed to number some 300,000 men, to which have been added the 100,000 Serb troops which were recuperated on the Island of Corfu. The opposing lines are held by perhaps 300,000 Bulgars, and the few Germans and Austrians still remaining in the Balkans. Estimates of the numbers, however, and conjectures of the probable developments are alike untrustworthy.

## June 20-July 20

Except for the political situation, already mentioned, there have been few developments in the Balkans. There has been some skirmishing between patrols west of the Vardar River, the Bulgarians having shown most activity in this respect. The positions recently seized by the Bulgarians on Greek soil have been fortified. The Allies, for their part, have taken over the operation of the Greek postal, telegraph, railway, and customs service.

With the reinforcements expected from Egypt, the Allies will have, according to their own statements, nearly 700,000 men, against the 300,000 estimated for the Bulgarians. The *Army and Navy Journal* comments:

"The riddle of the summer campaign is the situation in the Balkans. Surely now, if ever, would be the time for the Allies there to launch a strong offensive campaign. Neither Austria nor Germany could now spare reinforcements for the Bulgarians if they were hard pressed."

## July 20-Aug 20

Little news, except reports of Bulgar-Serb skirmishes, came from the Balkan sector this last month, until there broke out at the end of it the expected Allied offensive. Northward along the Vardar River, it appears, will be the main line of advance, with at least a containing force to guard the threatening line of the Struma River. Just what the significance is of the attacks on both allied flanks that the Bulgarians have initiated, it is too early to say. Further developments are necessary before discussing this new campaign, which is so rich in possibilities, and which completes the last link in the chain of Allied cooperation.

Transylvania, that part of Hungary which lies, as it were, a morsel in Rumania's coveting jaws, is separated from its eastern neighbor by a rugged mountain range. Over this wall the Rumanians came storming, coincident with, or indeed previous to, her declaration of war. The practicable routes across the mountains are limited in number; four different paths the invading forces followed. Farthest north lies the Gyimes pass through which a column struck westward. The Tömös, or Predeal pass, on the south, gives ready access to Kronstadt, the chief city of Transylvania. Farther west, the Rotenturm pass debouches on Hermannstadt. At these three entrance points the Rumanians encountered little resistance. They occupied Kronstadt on Aug 30, and Hermannstadt shortly afterwards. The Austrians evidently felt themselves unable to defend the long frontier, some 350 miles in length, and adopted the policy of a gradual retirement to a much straighter and shorter interior line, with its right flank at Orsova. By the third week in September, the Rumanian forces had penetrated some fifty miles beyond the eastern frontier, and were particularly active in the vicinity of Fogaras, thirty miles northwest of Kronstadt.

## Sept

A fourth Rumanian column, that struck into the corner of Hungary near the famous Iron Gates of the Danube, met with stiffer resistance. After several days' fighting the Austrians on Sept 2 abandoned Orsova, where the frontiers of Austria, Serbia and Rumania meet. Still another Rumanian force has crossed the frontier into Serbia, and is operating southward along the railroad that leads to Nish; it is apparently a small expedition, not formidable enough to threaten the important Oriental railroad line of the Teutonic allies.

Rumania, considering her size, has one of the longest frontiers of any of the belligerents. Concentrating her forces for the invasion of Transylvania, she had left her southern frontier but thinly guarded. Along a large part of her boundary, the Danube forms an effective barrier; the province of Dobrudja, however, adjoining the coast, has no such natural protective features. For the defense of this much disputed area, the Ru-

**EUROPEAN WAR—Continued**

manians evidently relied on the Russians, whose advance toward Varna would naturally lead them through this district. But the Russians were not yet at hand, while the Germans were ready and waiting to strike. On Sept. 3, a combined German and Bulgar force, under Mackensen, advanced rapidly into this region, and four days later captured the Rumanian fortress of Tutrakan, on the south bank of the Danube, the "gateway to Bucharest." Berlin claimed in addition the capture of 20,000 men and 100 guns. Three days later the invaders occupied Silistria, another stronghold farther east along the Danube. These important successes undoubtedly retarded the development of Rumanian and Russian offensive plans. On Sept. 16, Mackensen's forces, having advanced thirty miles beyond the frontier, occupied a line squarely across the province from Mangalia on the Black Sea to Silistria, and were threatening the important railroad line that connects Bucharest with the sea at Constanza, crossing the Danube at Cernavoda. Russian and Rumanian troops had been hastily rallied for the defense of this line; of the great battle that followed, little is yet clear, except that the advance of the Central Powers has been checked.

The Bulgar invasion of Greece was a somewhat surprising development on the Macedonian front. Instead of waiting to be attacked, the Bulgars vigorously assumed the offensive at both ends of the 150-mile front, and won positions that seriously threatened the expected Allied advance in the center. In the west, the Bulgars advanced down the railroad from Monastir through Florina and almost half way to Salonika. To the east they spread out with little opposition for some fifty miles along the railroad that parallels the Struma, occupied Seres and Drama, and reached the sea at Kavala. The capture of the Greek garrison of this port, an entire army corps was followed by an amazing development, namely, the transportation of these troops to Germany, not as prisoners but interned neutrals.

The Allied army of 700,000 under General Sarraill has as yet failed to disclose its main line of operations. Little serious attempt has been made to advance in the center and right, beyond feeling out the Bulgar positions with cavalry. In the region of Lake Ostrovo, however, the Serbs have been very active in driving back the Bulgars over the ground so recently gained. In this they have been successful, and on Sept. 17, their pursuing columns arrived in front of Florina.

The political effect of the Bulgar invasion has been to rouse the Greek people to such a state of frenzy that they can with difficulty be restrained in their anomalous status as neutrals. The Allies, who have from the start used Greek territory as if it were their own, have recently (Sept. 4) assumed control of the mail, telegraph and telephone systems of the entire country. Athens and other Greek cities are under martial law.

The Italians are co-operating with the Allied armies in Greece, and are represented in General Sarraill's army. One column, operating up the Viosia river from Avlona, has occupied the important Albanian town of Tepeleni.

*Oct*

At the end of the last period, Mackensen's army, having advanced into the Dobrudja until it had occupied an area about equal to that of Connecticut, was vigorously engaged with the Rumanian forces, reinforced by Russian troops, along a line a few miles south of the Constanza-Cernavoda railroad. As a result of this engagement, the German-Bulgar-Turkish army of invasion appeared to be checked, although Mackensen claimed a partial success in his enveloping movements. The Bulgars entrenched in places, and operations seemed about to develop into a trench warfare similar to that of the western front.

The Rumanians introduced an element of surprise into this deadlock. On Oct 2, a column of about 15,000 Rumanians crossed the Danube by means of pontoon bridges between Silistria and Tutrakan, in the rear of the enemies' lines. This daring move, which, if properly supported, might have seriously threatened von Mackensen's flank, proved to be a premature and abortive expedition. The bridges were destroyed in rear of the column by Austrian and German monitors, and the isolated battalions, scantily supplied with artillery, suffered a disastrous defeat, practically losing their entire force. (This report is disputed by the Rumanians.)

In the meantime, things were going badly for the Rumanians on their other frontier. First came the seizure by the Germans of the Vulcan Pass, which necessitated the withdrawal of the Rumanians from Petroseny, 15 miles north. Then Falkenhayn tried a similar plan at the Red Tower (Rotenturm) Pass, leading to Hermannstadt. After a circuitous mountain march, a body of Bavarian troops occupied this pass (Sept 26), at the same time that the captors of Hermannstadt were vigorously attacked. Retreating in disorder after a three days' conflict, the Rumanians found the pathway to their native soil blocked by the enemy, and had to make their escape, disorganized and piecemeal, as best they could.

Whether the preliminary retreat of the Teutons in this region was part of a premeditated plan to trap the Rumanians, or whether the counter-stroke was an afterthought conceived after the hasty summons of von Falkenhayn—in either event, the German campaign was a brilliant achievement, more than offsetting the successes of the Rumanians.

One after another, the principal passes changed hands, and German troops marched on to Rumanian soil. Kronstadt was retaken by the Teutons on Oct 8, and most of eastern Transylvania was soon thereafter cleared of Rumanians. In the Törzburg Pass region, by Oct 17, von Falkenhayn's troops had penetrated some 12 miles into Rumania, while

farther north, at the Gyimes Pass, they were seven miles beyond the boundary.

On Oct 15, King Ferdinand, following the example set by the Russian Czar assumed personal command of his armies in the field. The latter had by now recovered somewhat from the disconcerting effects of their sudden reversals, and were doggedly opposing the Germans' further advance, which appeared to be fairly well checked. French and Russian officers are reported to have been called to assist in the reorganization of the Rumanian troops.

As the period closes (Oct 20), Mackensen's army in the Dobrudja is particularly active on the right flank, the advance of which has threatened the railroad terminus and important seaport, Constanza.

Turning to the somewhat distant Macedonian front, the Serbians are found to have been most active. After capturing Florina, on Sept 18, the Serb troops pressed on across their own boundary line. One of their columns, north of Lake Ostrovo, seized the commanding heights of Kaimakalan Mountain, 7800 feet high. Their flank threatened from this vantage point, the Bulgars were forced to retreat another five miles. The Serb center, advancing up the railroad, occupied Kenali, 10 miles south of Monastir. French and Russian troops on the left wing near Lake Prespa kept pace with this advance. Subsequently, fighting has centered chiefly about the big bend of the Cerna River. Having first conquered this obstacle, the Serbs have now won the village of Brod, the hill of Skochivir, and other positions that are placing them nearer Monastir.

On the Struma front, the British are meeting serious opposition from the recently encircled Bulgars. Seres is at present the principal objective in this region. Their patrols having found this city strongly occupied, the English have proceeded to bombard it from a point two miles away. The arrival of Turkish detachments is reported in this region.

The central sector about Doiran has been the quietest of the entire front. Little is reported from here other than raids and skirmishing between British, French and Bulgars.

In Albania the Italians, operating from that base at Avlona, have been chiefly engaged with the Greeks, driving them from various villages in Epirus.

On Sept 27, Venizelos initiated a rebellion in Crete. Two weeks later, the same clever statesman, as much ruler of Greece as the helpless king, was directing a provisional government at Salonika. The French, on Oct 11, seized the Greek ports, and most of the fleet as it lay in the Piraeus.

A month ago, the full extent of Mackensen's success was by no means evident. After his rapid initial advance, he had been checked and held ten miles south of the railroad that connects Bucharest with the coast. The Russians held the center of this line, the Rumanians both wings. It seemed fair to assume that together they could summon forces

sufficient to guard this important railroad. But on Oct 19 Mackensen struck again, delivering his blow on the Allied left, close to the sea. The Russo-Rumanians were driven back with heavy losses. The strong supporting positions of Teprai Sari and Cobadin were taken, and the attacking army came on in a hot pursuit, which continued Oct 21 and 22, despite torrential rains.

Constanza, the seaport and terminus of the railroad from Bucharest, is a prosperous city of 12,000 inhabitants. Here had been landed the Russian troops that had come to defend the Dobrudja, and here lay a Russian fleet that was expected to join in the defense of the city. But the retreat of the Russo-Rumanians was so precipitate that no defense was attempted, and on Oct 23 the town was evacuated, the fleet slipping away after the sailors had set fire to the stores. In four days of fighting, Mackensen had taken 7000 prisoners, 12 guns, and several hundred railroad cars. On the same day, the Russians attempted to make a stand at Medjidie, farther west on the railroad, but were unable to hold this place against the flank attacks of the enemy. Thus the continued advance of the invaders first uncovered the center, then exposed the right of the Russian-Rumanian line, which made the rout complete. A part of the defending force made its way across the Cernavoda bridge over the Danube (Oct 26); the rest was driven north farther into the Dobrudja.

The retreat of the army in the Dobrudja continued northward across the barren steppes and marshes of that desolate country for about 30 miles. Their line then extended from Hirsova on the Danube east to the sea. The able Russian general, Vladimir Sakharoff, was promptly assigned to the command of the Allied armies in this sector. Ponton bridges were built across the Danube in three places to connect with northeastern Rumania and Bessarabia. Reorganized and strengthened, this army was soon again on the offensive, and was pushing Mackensen's forces back toward the bridge-head at Cernavoda almost as fast as they had advanced.

The Carol bridge at Cernavoda has the distinction of being the longest in Europe. After crossing the river proper (with one 600 ft. and four 405 ft. spans), there are still eleven miles of marsh and tributaries to the west to be covered by viaducts and causeways. The Rumanians, when they "destroyed" this bridge behind them, evidently did not execute a very complete demolition. For on Nov 10, Mackensen was reported to have crossed the Danube. Evidently this referred to the stream proper, and not the marshes; for the possession of the latter terrific fighting occurred along the causeway and about the marshes. While Petrograd reports the defeat of the Germans at Dunarea, the significant fact is that this town is on the west bank of the river, the first station on the railroad to Bucharest.

The most recent movements in this theater have not yet been disclosed.

**EUROPEAN WAR—Continued**

While Mackensen was winning his successes in the south, developments appeared to hang fire on the northern boundary of Rumania. Here the Rumanians seemed to have checked the invaders successfully. General Bertholet had been sent from France to organize the defense of this theater, and 128 French aeroplanes had been shipped via Russia to strengthen the air-service. Activity was reported all along the line, from Orsova to the Carpathians, but the reports were too contradictory to be extremely significant. The Germans appeared to be making their main effort through the Predeal pass toward Ploesci, the center of a rich oil country. Farther west, the Rumanians were making a promising counter-attack, where they held the Vulcan pass for a time and even threatened (so critics affirmed) the German east-and-west supply line further north.

Then came a time when the tenor of these reports from the Jiu Valley gradually and quietly changed. The Teutons had taken the Vulcan Pass (Oct 23); they were "very strong" in that region; their "persistent attacks continued." A fresh German army appeared suddenly near Orsova. Then came reports of advances made with a regularity that recalled the Serbian campaign; and on Nov 21 followed the unofficial report of the fall of Craiova, capital of the province of Wallachia. This practically gives the Germans control of the western quarter of Rumania, and places them squarely in rear of the Rumanians, who are holding the western boundary near Orsova.

Elsewhere, also, the reports indicated substantial progress for the invaders—toward Campulung, near Sinaia on the road to Ploesci, down the valley of the Alt, eastward along the Trotus. On Oct 31, Berlin reported that since Oct 10 Falkenhayn had taken 10,000 men and much war material.

The Serbian-French campaign against Monastir was a well-planned movement. Finding the direct advance barred by the formidable defenses of Kenali, ten miles south of Monastir, the Allies planned a wide turning movement to the east. This necessitated their crossing the Cerna at its great bend, where the fighting centered for a time. But a river is not a formidable barrier to an aggressive force, and once established on the other bank, the Franco-Serbs were able to outflank and dominate one after another the key positions of the defense. Thus the plain of Monastir was reached, and on Nov 19 the city, rendered untenable by the Allied occupation of commanding heights, to the east, was evacuated by its garrison. This success marks the first important gain of the Allies on the Macedonian front, and the difficulty of its capture contrasts strikingly with the ease with which it was occupied a year ago.

The pursuit of the retiring forces is being vigorously pushed. A full report of the final occupation is not yet available. German reinforcements have more than once been reported to have been sent to this sector.

In Albania, the Italians continue their progress eastward. On Oct 25, their cavalry got in touch with the Franco-Serbian left wing below Monastir. The Italian army, whose base is at Avlona, is commanded by General Piacentini, and is reported to number at least 300,000 men.

***The Caucasus***

The Grand Duke Nicholas has achieved what appears to be a decisive victory over the Turks in this region. The Turks occupied a 60-mile front in the vicinity of Lake Tortum. The center having been crushed and the entire army disorganized, a retreat commenced which ended only at the Erzerum forts. In this pursuit, the Russians claim to have captured 4000 men; Cossacks were used effectively to harass the fleeing Turks, and charged the rear-guard near the forts.

Field Marshal von der Goltz is reported to have been appointed Commander in Chief of the Turkish forces in the Caucasus.

*Jan*

Yesterday a minor and apparently unimportant field of operations, the Caucasus region has to-day assumed pre-eminence as the scene of a great and perhaps far-reaching Allied victory. Beginning in the fall of 1915, the Grand Duke Nicholas quietly assembled his forces for this daring mid-winter drive into Armenia. Basing his concentration on Batum, on the Black Sea, and on Tiflis and Baku, farther east, he pushed forward from the railroad at Kars, 50 miles from the Turkish frontier, with an army estimated at 300,000 men. The country between this point and Erzerum is a rough mountain land, with few roads; the weather at this season is an additional handicap, with blinding snowstorms, and the thermometer as low as 25° below zero, Fahrenheit. Yet the Russians advanced steadily against the Turks opposed to them, some two-thirds of their own number. The advance is said to have been made in ten columns, each flanked by Cossacks, on an 80-mile front. By the last of January the Turks, defeated at Niskala, were in full retreat, and the Russians were before Erzerum.

This Turkish stronghold, known for its successful resistance to the Russians in 1878, was defended by eighteen forts, half of which are claimed to have been built under the direction of German engineers, and armed with Krupp guns. The garrison consisted of from 60,000 to 80,000 troops. Reinforcements were reported to have started from Constantinople on Jan 25 (which failed to reach the city), and Field-Marshal von der Goltz, it was said, had been given command of the fortress. The city is on a plateau 6000 feet high.

*Feb*

On Feb 2 the Russian army, under General Judenich, carried by storm the outer lines of the forts. Thereupon began a bombardment with siege guns, which had been brought up with the utmost difficulty. The entering wedge of the assailants seems to have been the storming of Kop Mountain, to the south of the city. From that direction the engineers had considered the fortress safe against assault. With



this initial advantage, the other forts fell after five days of vigorous attack, in which charges with the bayonet played a prominent part.

The fall of the fortress was announced on Feb 16; with it the Russians appear to have captured 1000 guns and some 40,000 prisoners. The remainder of the Turkish army was reported retreating westward in great disorder. The victory was complete; it seems to have reflected great credit on the Russian assailants and their commanders, and to have shown that the eastern Turks are scarcely soldiers of the same caliber as their brethren of the Gallipoli Peninsula.

The small Russian forces in Persia can fairly be regarded as a wing of the army of Nicholas in the Caucasus. They were despatched there through fear of pro-German agitation in northern Persia, which is under Russia's sphere of influence. The present situation is that Hamadan, Kurn and Kermanshah, the centers of the disaffected area, are in Russian hands. The force near Hamadan is only some 200 miles from Kut-el-Amara.

#### March

The first reports of the capture of Erzerum were at fault in regard to the number of Turks made prisoners. Some 13,000 of the garrison were taken by the Russians, instead of the 80,000 claimed; the remainder were successfully withdrawn by Kiamil Pasha.

In other respects, however, the Russian achievement has not been exaggerated; rather has it increased in extent as the Grand Duke Nicholas' troops have continued to overrun Armenia. Forty miles west of Erzerum, the retreating Turks turned, and their resistance stiffened at this point. Russian progress through the difficult country to the north has been as rapid as could be expected, and her columns, as well as her fleet, are now closing in on the important Black Sea port of Trebizond.

The progress of the southern Russian column has been even more rapid. After the fall of Erzerum, the capture of Mush, west of Lake Van, was promptly reported, and on Mar 3, the Russians took by assault the important fortified town of Bitlis, some 400 miles from Bagdad and less than 50 miles from the Tigris. From here they can proceed either up the river toward Diarbekr (on the road to the railroad junction of Aleppo), or down the Tigris to Mosul (on the route to the besieged British force at Kut-el-Amara).

Still another Russian column, under General Judenich, is thrusting the defeated Turkish third army due west, and having taken Mamakhatun, now aims at the important military base of Erzingan.

#### The Dardanelles

During the first three weeks of December, the dispatches from Gallipoli described merely the usual happenings—artillery duels, bomb-fighting, aeroplane raids, etc., with no gain of note on either side. On Dec 20, however, England reported the successful withdrawal, the night before, of the entire force

from the Suvla Bay and Anzac positions. These lines, held by the Australian and New Zealand corps, had been occupied at heavy cost with the intent of attacking the Dardanelles forts from the rear; for months this narrow strip of land, waterless, scarce 1000 yards wide, has been held with but little progress against the strong Turkish positions on the heights. At one stage, when the Turkish ammunition supply was very low, it is stated that success would probably have attended the vigorous prosecution of the attack.

The retirement, though judged very precarious, was carried out, the British claim, with great smoothness and practically without casualties, the Turks being deceived by the explosion of a mine, and the final stages of the withdrawal, after discovery by the Turks, being covered by the guns of the fleet. The Turks, however, report the capture of many prisoners and much booty.

"Just how many British and French forces continue to occupy the tip of the Gallipoli Peninsula, known as the Krithia or Sedd-ul-Bahr front, is not known. It has been estimated unofficially at about 40,000 men. This line held extends almost due north from the mouth of Kereves Dere to a point a third of a mile from the village of Krithia. Here it turns southwest and runs generally in that direction through the 'Nullah' to the sea. At its further point it is approximately four miles from the tip of the peninsula and two miles short of the height of Achi Babi, the objective of the landing. The French hold about one-third of the line extending from the extreme right." This position, it is thought, may be permanently held in order to control the entrance to the Dardanelles from the land.

The total British losses in this disastrous campaign, for both army and navy, are some 115,000, of whom 25,000 were killed.

#### Jan

Gen. Ian Hamilton's report of the operations of the British forces in the Dardanelles up to the middle of October the time of his relief, was made public in London, Jan 7. The report, which is a lengthy one, shows that the Suvla Bay landing failed to accomplish its object partly because the force consisted largely of untried troops under generals inexperienced in the new warfare and partly through the failure of the water supply. The sufferings of the troops for lack of water make painful reading. General Hamilton bestows the highest possible praise upon the bravery of the men. He believes that after the middle of August the Turks outnumbered the British and had plenty of fresh soldiers and munitions, while the British government was unable to furnish him with the reinforcements he wanted. The report also implies that victory snatched from the grasp of the Franco-British by the Turks was due to lack of initiative and resolve on the part of General Stopford, the corps commander, and the division commanders, who failed to act decisively when Constantinople was almost with-

**EUROPEAN WAR—Continued**

in their grasp. The General strongly opposed the abandonment of any of the bases held by the British troops.

The brief British statement of Jan 9 that tells of the final complete abandonment of the Gallipoli Peninsula states:

"Gen. Sir Charles Monro reports the complete evacuation of Gallipoli has been successfully carried out. All the guns and howitzers were got away, with the exception of seventeen worn-out guns which were blown up by us before leaving. Our casualties amounted to one member of the British rank and file wounded."

The Turks, however, claim that the British and French troops were driven off with great losses, and that much booty fell into their hands. In a later despatch given out on Jan 11, Lieut. Gen. Sir Charles Monro, the British commander, tells how the last of the British troops to withdraw from Gallipoli were embarked during a storm that tore away piers and drove one vessel ashore. The fire from the warships supporting the troops, General Monro says, was very accurate, and this was spotted by aeroplanes.

Mr. Ellis Ashmead-Bartlett, British correspondent, who was selected by the press of London to be its representative with the expedition against the Dardanelles, in a long interview in the New York Herald of Jan 10 as to the evacuation said, in part: "Proper knowledge of conditions of modern warfare would have prevented the undertaking at all. Even if it had been though advisable to attempt the capture of the Gallipoli Peninsula the attack should have been at the neck of the peninsula, instead of at the tip. It is barely possible that in that way the Turks could have been isolated and the reduction of the forts effected by cutting off their communications. The final withdrawal is the last movement in a great tragedy that has gradually worked out since last March. The British Empire has lost 200,000 men and a good many battleships. It has accomplished nothing at all.

"The injury to the Allied cause is not in the withdrawal, for it is not in the Near East that the war will be decided. It is the pity of it—that 200,000 of the best troops of the British army, regulars, territorials and the gallant volunteers from Australia and New Zealand, should have been sacrificed against an enemy who is not really our opponent and against whom we should not be fighting, except for mistakes of diplomacy.

"The error of the Dardanelles is not wholly the fault of any individual, but the fault of our system. No General Staff worthy of the name ever would have advised the landing of troops in such a difficult, mountainous country, the defenses of which had been developed by German engineers. The trouble was that each member of our Cabinet could devise a scheme of his own and get a certain amount of expert authority to back him up. Mr. Winston Spencer Churchill, then at the head of the Admiralty, conceived the idea of for-

cing the Dardanelles and carried out its first movements."

Mr. Ashmead-Bartlett said the situation, already serious, became much more precarious after the arrival of the German submarines last August. He told of how two battleships, on one of which he was on board, were torpedoed, and of the disarrangement of the transport service caused by the presence of the undersea craft. "Up to that time the battleships, by their fire, had been protecting the flanks of the detachments," he said. "It became necessary to withdraw them to sheltered harbors and to place that duty upon the destroyers."

"We had been able to land practically no heavy artillery, and every part of our positions was swept constantly by Turkish shell fire. The supply of water was another difficult problem. At no time did our troops succeed in taking a commanding position, but were held to strips of a few thousand yards along the beaches." The final British effort in August cost 50,000 men and accomplished nothing. Since then, he said, withdrawal was a foregone conclusion.

*See also*

**DARDANELLES, OPERATIONS AT THE (1915-1916)**

**Egypt**

"In Egypt several detachments of the Senussi are operating against the British. They are said to have driven a British detachment out of the Siwah district, which is a Libyan desert oasis 300 miles southwest of Alexandria. The Senussi have shown excellent fighting quality, and are an interesting and not very well known secret Mohammedan organization, with a widespread membership in North Africa. Nothing more serious than outpost engagements are anticipated, at least for the present."

*Jan*

A British force under General Wallace has made headway against the Senussi tribesmen in Western Egypt. On Jan 23, 4500 of the Arabs were engaged near their camp at Hayalin and forced back three miles, with a loss of 650 men. British losses, 100 men.

In western Egypt, General Wallace's column has reported a victory over 4500 western Arabs at Hazalin, capturing their camp and inflicting casualties of 650. The British losses were twenty-six killed and seventy-four wounded.

*March*

In Egypt a column of tribesmen was routed by General Lukin's force at Agagia, fifteen miles south of Barami. The British force is composed of South African troops, Dorsetshire yeomanry and Territorial artillery. Aeroplane scouts reported the enemy retreating southward, hotly pursued by the British cavalry. More than 200 dead or wounded tribesmen were found on the field.

Later the British occupied with little opposition the town of Sidi Bavani, which had been for three months occupied by tribesmen, and Sollum, on the Egyptian-Tripolitan border. The Senussi are thought to have abandoned

their position at Msead and many of the local Arab tribes are surrendering.

*May*

In Egypt the Turks are again active. One of their aeroplanes flew 200 miles across the desert to El Kantara, on the Suez Canal, where bombs were dropped on a British camp. On Apr 23 a force of 500 Turks attacked a British post in the Quatia district at the village of Dueidar. The arrival of reinforcements gave the victory to the British, who captured 28 and killed 70 of their assailants. At the same time 3,000 Turks with three guns attacked Quatia village, from which they drove out a force of British yeomanry after a severe engagement. The Turkish report says they annihilated four British squadrons and captured 300 men. On the following day the Turkish camp at Quatia was heavily bombed by eight British aeroplanes. Quatia is only 25 miles east of the Suez Canal, and the news of this fighting is the first indication that there were large organized Turkish forces so near to the great waterway. The British are conducting aeroplane raids constantly on this front to prevent a repetition of the disastrous surprise at Quatia. The Turks are said to be completing a railway through the desert east of Suez.

Farther west there is reported to be an uprising of Soudanese tribesmen, who are said to be marching northward in large force and with many camels. Ali Dinar, the Iman of Darfour, has proclaimed a Holy War against the English and proposes to co-operate with the Senussi.

*May 20-June 20*

"In Africa on May 23 a British force under Colonel Kelley defeated 3000 troops of Ali Dinar, Sultan of Darfur, at El Tasher, in the Sudan. The losses to the Sultan's forces are estimated at a thousand and the British had five killed and 23 wounded. Aeroplanes pursued and bombed the retreating natives."

Turkish aeroplanes have raided a British camp at Rumania, 25 miles east of the Suez Canal, and inflicted heavy damage by bombs and machine-gun fire.

British warships and aeroplanes have bombarded El Arish on the Mediterranean, about 100 miles east of the Canal.

*July 20-Aug 20*

Before the Russian invasion of Armenia, with its effects so disconcerting to Turkey, an attack against the English at Suez would have occasioned no surprise. As it was, the advance of some 14,000 Turks along the Mediterranean coast from El Arish was not a formidable expedition. They attacked a British position near Romani, east of Port Said, in the morning of Aug 4 before daylight. The British, supported by the warships in the Bay, and occupying fortified lines, had the situation well in hand. However, the next day they retreated, simulating a model rear-guard action, with the pursuing Turks attempting to envelop their flank. Later came a British counter offensive, which was completely successful, winning 3000 prisoners, and driving the enemy back 15 miles.

Further skirmishing has occurred between the Turks and British cavalry, the Turks claiming to have inflicted heavy losses.

British aeroplanes have been active in this theater, having made attacks on El Arish, east of the Suez Canal, and at Port Said. Some minor engagements have taken place in the vicinity of the canal, notably at Bir-el-Mazar, where an indecisive action is reported.

*Mesopotamia*

The British reverse in Mesopotamia was the more bitter because of its unexpectedness, and of the effect it may have on British prestige throughout the East. General Townshend's little force, some 20,000 men, after a year of untold hardships and fighting, had reached a point almost within sight of Bagdad. After fighting gallantly against three times their number of Turks at Ctesiphon, the English retreated more than a hundred miles to the entrenched camp at Kut-el-Amara, where they are now besieged. The Turks report that the siege is progressing favorably, and they are continuing aggressive tactics. General Townshend reports heavy bombardments, and states that on Christmas Day one division of Turks effected a lodgment in the northern bastion, from which they were finally driven.

It is according to British tradition that an English detachment should be fighting its way over hot desert sands to the relief of a besieged force. Over a year ago, an expedition set out from Bazra toward Bagdad, some 350 miles up the Tigris, with the double object of maintaining the English mastery of Persian Gulf and of protecting the oil wells near its mouth, east of the Karum River. This column, it is estimated, comprised some 20,000 regulars, a somewhat larger number of native troops, and was supported by a fleet of gunboats working up the Tigris. Step by step its slow, painful advance was won; it seemed that Bagdad itself was within its grasp, and England prided herself upon the success of this mission. But at Ctesiphon, in Dec, 1915, General Townshend's force encountered an army of Turks that outnumbered them 4 to 1; after an indecisive conflict, they were obliged to retreat a hundred miles down the river to the fortified town of Kut-el-Amara, where the pursuing Turks have surrounded and besieged the survivors, some 10,000 strong. In the Christmas fighting, reported last month, their losses were about 400. Recently, the Turks have not pushed the siege so vigorously; meanwhile, General Aylmer's column of relief has fought its way, with increasing difficulty, to a point about 20 miles east of Kut. There, at Meularic, on Jan 21, the Turks report a severe check to the British, with losses of 6000 men. Further progress seems difficult, whether because of the high floods, or of the numerous hordes of Turks blocking the way.

The garrison at Kut-el-Amara has another hope of relief in a Russian column, which has just occupied Sultanabad, some 200 miles

**EUROPEAN WAR—Continued**

to the northeast. This force is separated from Kut, however, by a mountainous country threatened by hostile tribesmen. One of the Persian chiefs, Nisam Saltane, is reported to have 10,000 fighters.

This theater is included by the Germans in the single caption, "Caucasian Operations"—which shows that they appreciate the underlying singleness of purpose in all this eastern campaign, though the field is a wide one and the different nationalities are sorted like a five-layer cake.

Scant reports come from the vicinity of Kut-el-Amara. During the first week in February, the trenches about that city were flooded, and the Turks had to draw back their lines over a mile. The relief column under General Aylmer is still struggling against weather conditions and superior numbers of Turks to reach their beleaguered comrades. Gen. Townshend's report to London that he is not suffering from any shortage of provisions has somewhat alleviated the concern of the English, who are following the fate of this expedition with so much anxiety and interest.

According to recent fuller accounts, the battle of Ctesiphon, fought last November, almost within sight of Bagdad, began as a victory for the British. The first line Turkish trenches were carried on Nov 22, but opportune reinforcements enabled the Turks to hold their second line, and to counter attack effectively the following day. On the 25th, there was nothing left for the English, short of munitions and without reserves, but to retreat before the greatly superior enemy forces. The retreat was contested all the way to Kut-el-Amara, and was skilfully conducted by General Townshend, who has gained from the entire campaign nothing but praise. The total English loss was 4500, about a fourth of their number. The Turks have been estimated to outnumber the British as much as six to one; the *Army and Navy Journal*, however, judges them to have had only a fifty per cent superiority. As to the wisdom of attempting that 500-mile march to Bagdad from the coast, this journal comments as follows: "From such scanty accounts as are available, the battle of Ctesiphon and the disastrous conclusion of the first Mesopotamian campaign—no other words can describe it truthfully—is a first-rate illustration of the folly of assigning too few troops to an important undertaking. The British War Office knew that events were so shaping themselves in eastern Europe that the Turks would be able to withdraw troops from the Bulgarian frontier, yet notwithstanding this, they permitted the development of the Mesopotamian campaign without a word of warning or without attempting to supply the necessary reinforcements. It would have been far better for the British troops at Kut to have awaited the arrival of the divisions that are now trying to fight a way to them."

*Feb*

On Feb 12 was announced a British defeat

near Korna, 150 miles south of Kut-el-Amara, on the Tigris where it joins the Euphrates. The British retreated hurriedly, abandoning many dead and losing prisoners, arms, munitions and transport animals. Later Turkish reports told of a British defeat near Batilia, in which they lost 2000 men and 300 transport animals.

*March*

Things have not gone well with the British forces in Mesopotamia. Not only has General Aylmer been unable to cut his way through to the relief of General Townshend's invested force at Kut-el-Amara, but the third expeditionary force, under General Brooking, which had gone up the Euphrates as far as Nasirjeh, has been checked at that point. On Mar 17, the Turks reported the British forces on the Tigris below Kut, to be making a general retreat, after their defeat near Felahie on Mar 8. This force, it is true, has displayed considerable aggressiveness. The brightest hopes for General Townshend's relief, however, appear to lie in the Russian columns approaching from Persia, and the tightening pressure that is being generally brought to bear on the Turk.

*April*

Later reports from the Tigris Valley have brought more encouragement to British hopes of relieving Kut-el-Amara. Soon after the retreat of General Aylmer's column from Felahie, harassed by pursuing Turks, General Lake reported carrying by assault the Turkish entrenched position at Umm-el-Henna, 220 miles downstream from Kut. Saps were pushed to within 100 yards of the hostile position, which comprised three lines, altogether 2500 yards in depth. After an aerial reconnaissance, Felahie, about four miles away, was then taken in a night attack delivered by General Gorrings's column. This partial success, like a former one at Ctesiphon, seems to have been followed by a retreat in the face of superior numbers. Similarly, the advance reported by General Lake on Apr 15 to have been made along the south bank of the Tigris was offset by strong Turkish counter-attacks on Apr 17, which forced back the British lines some half mile.

General Townshend's casualties to date are said to be at least 8100, and his need for relief in the disease-stricken town may well be desperate.

*May*

From the reports of the surrender at Kut-el-Amara, it is evident that General Townshend held out to the last extremity. General Gorrings, who had succeeded Gen. Aylmer as commander of the relieving columns, had repeatedly thrown his men against the Turkish barriers only 15 miles down the river. Felahie was finally taken by storm, but the position at Sannä-i-Yat held firmly against repeated attacks, Apr 21. In response to urgent appeals from Kut, General Gorrings made a desperate attempt to send provisions into the town by means of a river steamboat, manned by volunteers. The little craft crept by the Turkish lines at night in safety, but in her dash for

the town was stranded high and dry on the beach.

The garrison had subsisted for two weeks on a ration of 4 ounces of flour, and the flesh of their slaughtered horses. The only provisions which had reached the city had been dropped from aeroplanes flying overhead. After the failure of the last hope of relief, General Townshend offered to surrender his artillery and money, on condition that his troops be allowed to retire down the Tigris. Upon the refusal of Halil Pasha, the Turkish commander, to accept these terms, the British general surrendered unconditionally. A total of 514 British and Indian officers, including four generals, were among the prisoners. The loot is said to include \$5,000,000 in cash. General Townshend was permitted to keep his sword, and the Turks promptly announced their willingness to exchange sick and wounded British for Turkish prisoners. The plans for the successful Turkish campaign in Mesopotamia are credited to the great German Field Marshal von der Goltz, who died Apr 19 at Turkish headquarters. Rumors have been heard that the Field Marshal was assassinated by a Turkish Anatolian officer.

The surrender of Kut-el-Amara has caused little change in the situation of the relieving columns farther down the Tigris. It appears that General Lake has not retreated from his position near Felahie, where actions have been reported. From the other side, Bagdad is being approached by the Russians, who have reached and taken Khanikin, on the road from Kermanshah in Persia. This route leads through the mountains to the plains of Mesopotamia, where it emerges about 70 miles northeast of Bagdad.

May 20-June 20

On May 21, General Sir Percy Lake, who now commands the British forces on the Tigris, made the remarkable report that "a force of Russian cavalry has joined General Gorrige after a bold and adventurous ride." These Cossacks probably came across the mountains from the Russian forces in Persia. Their exploit seems to lack the special significance first attached to it. General Gorrige has advanced his position somewhat up the Tigris, but the Turks still hold their strong Sannā-i-Yet position before Kut-el-Amara.

The importance of Mosul, some 250 miles up the Tigris from Bagdad, lies in the fact that here the overland caravan route from Aleppo, along which the German Bagdad railroad was to pass, reaches the Tigris. Russian advance toward this junction, however, has been slow and hampered by considerable opposition. At Khanikin Pass, too, where the Russians expected to win an easy entrance into Mesopotamia, they now report the Turks to be strongly intrenched.

"In Persia a Russian column has occupied Sakiz and the village of Baneh, which indicates a new movement midway between the column advancing toward Mosul and that at Khanikin Pass."

June 20-July 20

Minor reverses are reported to the British troops below Kut-el-Amara. An expedition up the Euphrates from Kurna was driven back with considerable loss; and on June 10 three British barges were sunk by Turkish guns. The position of the English column is somewhat precarious.

Along the Persian border, the Turks have continued their successful defense of the Bagdad region. The Russian column that threatened the Khanikin Pass was driven back with a loss of 800, and its retreat harassed by the Turks. On July 6, the pursuing Turks entered Kermanshah, well into Persia, though there is some doubt as to their having retained this city. Another Russian detachment, which appeared on the Persian frontier at Suleimanich, 175 miles northeast of Bagdad, was compelled to retreat after a three-days' conflict with a mixed Turkish and Persian force. Nothing except stiff skirmishing has been reported from Mosul.

A strong Turkish force advancing from Mosul has compelled the retreat of the Russian column operating in that sector.

On the Tigris the situation is unchanged, and quiet.

Skirmishes are reported occasionally between the British and Turkish lines both on the Tigris and Euphrates. A night assault by the English at Felahie, near the old Kut-el-Amara position, resulted, the Turks claim, in a loss of 2000 men to the assailants.

In Persia, the Turks claim successes southeast of Hamadan, at Bijar and at Sakiz; the Russians were later successful at the latter place.

See

KUT-EL-AMARA, BATTLE OF

Persia

"In Persia, a Russian column won a battle at Robatkerim, twenty-five miles southwest of Teheran. The Persians lost some hundreds out of a force estimated at several thousand, and are said to have been dispersed. This Russian force is about 220 miles from the besieged army of General Townshend at Kut-el-Amara on the Tigris, and may be able to fight its way through to the assistance of that hard-pressed British army."

March

The Russian campaign in Persia progresses favorably. Having forced two very difficult mountain passes, Bidesurks Pass and Sakhac Pass, the Russian force pushed on vigorously and on Feb 25 captured the important city of Kermanshah, which is on the road from Teheran to Bagdad and is about 150 miles northeast of Kut-el-Amara. Since that time, this column has worked 50 miles westward; a like distance will bring it to the last difficult mountain pass near Khanikin, where it will be in a position to strike at the railroad north of Bagdad.

Another Russian column in Persia is reported to have entered, on Mar 19, the old

**EUROPEAN WAR—Continued**

Persian capital Ispahan, a city of 80,000 inhabitants.

July 20-Aug 20

"In Persia the Turkish and Persian forces appear to be continuing their successes against the Russians retreating from the Kermanshah region." Reverses were suffered by the retreating Russians at Revanduz and Sakiz.

**FAR EASTERN THEATER**

See also

TSINGTAU—SIEGE OF

**NAVAL OPERATIONS**

[The New Blockade. By Rear Admiral Degouy. *Revue des Deux Mondes*, Feb 15, '16. 6000 words.]

It was a painful discovery for the English when American statistics appeared, about Jan 15th, which proved the inefficacy of the blockade of Germany by showing that the latter had not ceased to be supplied by the neutrals of the north,—Dutch and Scandinavian,—sufficiently to be in a position to continue the struggle for a long time.

After all, the surprise was not general. Many observers had been deducing, from certain facts which came to the public knowledge, the painful conclusion that we were deceiving ourselves as to the effects of the "economic suffocation" of the enemy. Some of them, from the beginning of the "struggle of attrition," had been sure that among neutrals bordering on Germany pecuniary interests would do everything to be satisfied. It was clear that many subjects of these little states would undertake with ardor and skill to procure Germany anything indispensable for the continuance of "her war." To think that any consideration for us would deter them was to not understand well the resources, the expedients, and the long preparation for an economic war of our methodical enemies. It was to ignore the prestige they enjoyed, the fear that they inspired in those weak peoples, perhaps certain agreements.

Perhaps when we are told that the neutrals of the north are importing seven or eight times more than is necessary for their own needs, we should not conclude that the excess goes straight to Germany. I have received from a prominent Dutchman a letter stating that his country is obliged to feed and support several hundred thousand Belgians. This is a little insufficient as an explanation, and the Belgians, of course, do not need so much copper or rubber, transported surreptitiously by parcel post. The English government, moreover, has not tried to deny the relative inefficacy of the present blockade and it has declared that it was going to take all necessary measures to draw it tighter.

Was there, indeed, a blockade? The English say yes, the Americans say no; and if we mean a complete blockade, an *effective* blockade, in the sense that international law gives to that adjective, it must be admitted that the Washington government was right in its contentions, since, beyond a doubt, the

ports of the Baltic, the ports of far the most extensive coast of the German Empire are not blockaded at all by the English and since the very ports of the North Sea are only blockaded at a great distance, at such a distance that a "blockade-runner" of the type of those which entered Charleston so brilliantly 50 years ago, would certainly have chances to pass unmolested.

Now, this question of the reality, of the "effectiveness," if I may say so, of the blockade of the enemy's coast, is juridically of considerable importance. It is, indeed, the express condition of the legitimacy of the exercise of the "*droit de suite*," which permits the blockader to inquire into the ultimate destination of such an object or substance, figuring on the list of contraband of war and transported by a neutral vessel to a neutral port. If this is the port of a power bordering on the blockaded belligerent, the blockader has the right to suspect that the belligerent is the one that, in the last analysis, benefits by this object or this substance.

"Until you have penetrated the Baltic," say the United States, who know very well what difficulties such a condition presents to the mind of the English authorities, "we cannot, in all justice, admit the legality of the control, more and more strict, which you exercise over our cargoes consigned to Rotterdam, Bergen and Copenhagen, still less the seizure, or even the retention of merchandise whose final destination is the object of a doubt which, whether justified or not, suffices to make you stop everything."

These observations were presented with force, at least in their expression. So we may ask ourselves to what degree of energy the American protests will arrive and what might be the consequences.

\* \* \* \* \*

One of the intermediary neutrals ("transitaires" as they are commonly called), Sweden, not very much disposed to favor the Allies (this was more true before the war than it is now, the Germans having lost by their conduct of the war much of the sympathy acquired before the war), has manifested that there would be difficulties if Great Britain persisted in her restriction of the legitimate rights of neutrals. There are grave reasons for not alienating the most powerful Scandinavian nation, and the best armed—300,000 men perfectly equipped and supplied, it is said. It is the one best placed to injure us, or our Russian allies, if only by the interruption of the latter's communications with the Norwegian ports. Besides, having become an industrial nation, Sweden is in a position to export to England and us very useful manufactured products.

Last summer it seemed that the brilliant exploits of the English submarines would permit the Allies to confront the most recalcitrant neutrals with a real blockade. Germany was worried for fear she would lose the mastery of the Baltic. But, little by little, the bad season aiding, the German patrols obliged the English and Russian submarines

to return to Reval. The fruitful campaign was suspended, and it became difficult for the Allies to talk of an effective blockade of the enemy's coast. The American argument then took on again all its value at a time when it would have been most useful to prove the contrary. And that is where things still are in respect to this important matter.

\* \* \* \* \*

Following new torpedoing of steamers in the Mediterranean without preliminary warning, the government of the United States had renewed its protests, its investigations, its demands for explanations. The *Lusitania* affair even was taken up again and, indignant that Germany should disdainfully confine herself to offering a pecuniary indemnity to the families of the American victims, the Washington government demanded that the submarine commander be disavowed and punished. On Jan 29, President Wilson made known, in a positive manner, his views on some of the methods of the submarine war.

Some of the articles of this document do not appear to be penetrated with a sense of the realities. No sailor would have consented to admit, as a principle, "that a merchant ship may be sunk only if it is impossible to convoy it and, in that case, the passengers and crew must be saved." Evidently, a submarine cannot "convoy" a merchant ship. It cannot do so, practically; it can do so still less from a military point of view. It would be suicide, generous suicide, which is difficult to expect from our adversaries.

As for the obligation of saving the personnel of the ship, what can the submarine do about it? A surface cruiser of great size can,—not very easily, at that,—take on board the crew and passengers of a steamer of medium tonnage which it has resolved to sink. You cannot really demand the same thing of a frail shell of a few hundred tons, in which 20 men have difficulty to move around. All that a submarine commander can do is to permit the unfortunates that he has just attacked to embark in boats before their ship is engulfed. These boats are not always sufficient in number. They are overloaded; they sink alongside the ship. Suppose they can get away and navigate. What will become of them if the wind comes up and the sea becomes heavy? Besides, no provisions, no clothing. They have not had time to take them. In short, three times out of four, it is not a question of saving human creatures from death; it is a matter only of prolonging their agony. But the "principles" are respected.

Clause 4 of the proposed arrangement is that "the attack of the merchant ship must cease as soon as the attempt at flight or resistance ceases." Can it be imagined that a German submarine, which shall have commenced to shell a steamer on the move, will cease firing at the exact moment that the merchantman stops? It is known that, at average distance of fire, and under the special conditions of an emerging submarine, it is very difficult to determine whether the steam-

er is on the move or motionless. And what will be the result when that steamer, armed as they are or are going to be, shall have exchanged shot for shot with the assailants? Can you imagine that assailant—waiting patiently before continuing his fire, to be very certain that his victim, decidedly resigned to his fate in that case, has given up using his cannon? That is neither military nor seamanlike. Such clauses, necessarily, remain a dead letter.

What will be the result of the dispositions announced by the American government relative to merchant ships armed exclusively for their defense? The United States intends to refuse them entrance into her ports unless they submit to the conditions governing warships, as well say unless they consent to the eventuality of an expulsion without having been able to unload their cargo or to take on a new one.

Let us notice that this question can only concern the merchant ships of the Allied Powers, those of the Central Empires having disappeared from the seas. We resolved to provide our steamers and great "cargo-boats" with a few light cannon, useful only against submarines, only when we became more than certain that our enemies had decided to sink anything without warning. So that, in all justice, we cannot be expected to give up such legitimate measures of protection. The acceptance of the American principles by the German and Austrian governments will paralyze completely the operations of submarines against merchant ships. Is President Wilson disposed, under such conditions, to guarantee the good faith of the Wilhelmstrasse and of the Ballplatz if, perchance, the two empires accepted the principles in question? I do not think so.

Thus we see to what may lead, even in the best minds, the anxiety of keeping the balance exact, between two groups of belligerents, when that anxiety, of a purely political and circumstantial order, is substituted for the only preoccupation worthy of a great civilized nation, that of the respect of the inalienable and absolute rights of humanity.

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But what will happen when, to these difficulties are added those arising from the operation of the allied cruiser in the North Sea and the channel acting exactly as if a sufficient allied naval force were blocking effectively the German Baltic coast? I shall not hazard vain predictions. It is enough to say that there is sufficient material for serious reflections on the part of the Allies, and especially of Great Britain. To realize the delicacy of it we must go back several months and read the most significant passages of Mr. Balfour's letter for publication on the subject of the English "Home fleets," Sept 7, 1915:

"German statesmen," says the First Lord of the Admiralty "were too well-informed to suppose that they could immediately have a navy equal to that of the Power which constituted the most formidable obstacle to their

**EUROPEAN WAR—Continued**

projects of domination; but, however, they did not leave doubtful the advantages that their naval policy might bring them.

"They calculated, indeed, that a powerful fleet, even if it was numerically inferior to the British fleet, could, nevertheless, hold it in check; for no English government would dare to risk a conflict, which, although it might terminate victoriously, might leave it definitely with naval forces inferior to those of any third Power."

That third Power, to which England does not wish to be inferior after a naval victory dearly won, is not any Power. It is America, whose fleet may, indeed, be considered of sufficient importance to counter-balance British naval strength, if the latter should lose a certain number of *dreadnoughts* in a decisive battle against the "Hochsee Flotte." (The United States has in commission 39 battleships, 14 of which are "dreadnoughts.") They could put about 30 in line in the Atlantic. The English fleet would have to lose half of its strength to find itself inferior. It should be noted that England has 10 "battle cruisers" more than the American fleet; these are fast "dreadnoughts.")

To tell the truth, if the reflections that I have just quoted still translate well the pre-occupations of the English government, these apprehensions appear very much exaggerated. It seems unlikely that the United States contemplates the possibility of an armed conflict with Great Britain, however acute the discussions of a commercial nature may become, at the time when its administration is bitterly reproaching Germany for refusing to disavow the acts of her submarine commanders. Besides, how can they forget over there that England has two allies, France and Japan, whose fleets would be added to her "home fleets"? The addition of our five "dreadnoughts" and our six *Diderots* would be sufficient to reestablish the equilibrium. As for the Japanese fleet, it is well known what a powerful diversion it would create on the coast of the western States, which are the ones precisely which have the most Germanophiles. Nothing of all this is unknown to those whose interest it is to know it and, in reality, if human foresight is still of any value in this extraordinary crisis in world politics, we are permitted to affirm that neither England nor ourselves (to whom it would be particularly painful) nor Japan, very busy in China, will be engaged in a struggle that would shock violently the intimate feelings of the greater part, at least of the most "human," the most moral, the most respectable part of the American nation.

Let us count also on our enemies, whose mistakes serve us as well as our own merits, as frequently happens in war. As I said just now, the excess of this pride holds back from their lips, at this very moment, the disavowal of their acts. If they persist in their attitude, let us rest assured of the rupture of their diplomatic relations with the Washington Cabinet. That is the least that can hap-

pen, undoubtedly. If they do not persist and if they give President Wilson satisfaction in this respect, we may be convinced that their wounded arrogance will desire revenge and that they will commit new and maladroit outbursts. In any case, either they will accept the terms of the proposed agreement as to submarine operations, or they will violate the American principles mentioned above. And they cannot do otherwise, as I demonstrated just now, without giving up the benefits which they still expect from submarine war.

\* \* \*

But if we have a right to reject the idea of serious complications with America on the subject of the tightening of the blockade of Germany "through the neutrals," it is not doubtful that the measures announced will provoke frequent and painful incidents. There will be reprisals, of which the least is the one promised us now; the refusal to receive in American ports, as merchant ships, the liners and "cargo-boats" armed against submarines. It is clear that, as long as we depend, however little, on the great American factories for supplies, it will be to our interest to treat with consideration a public opinion which, for the most part, will always be sensitive to material considerations. The "Pro-Germans" will always be able to make an impression on that opinion by claiming full liberty for maritime commerce, such as it is defined in time of war by the present rules of international law.

A like interest would council a conciliatory attitude towards Sweden. Important products come to the Allies from there and not only to the Russians, as some think. It was lately reported that the Swedish ministry of supply had decided to refuse to send wood-pulp to England. The gravest problem is that of the transit of supplies by the ports of a discontented Norway and the railroads of a hostile Sweden.

A few weeks ago we were told that the railroad which will connect the Mourmane coast with Petrograd was about to be operated. (This coast, close to the northern branch of the Gulf Stream, which there takes a turn towards the southeast, is nearly free of ice in midwinter.) This report must be discounted. Even by taking the route by the western shore of the White Sea, which does not seem very practical except in the heart of summer, one cannot go from the Kola port of Alexandrovsk to the interior of Russia before the month of April. The branch which is to go along the White Sea, from Kandalatsk to Kem, is indeed difficult to construct, crossing a region of marshy bogs, where nothing can be built except on piles. In fact, the Allies will still be obliged to use, for a long time, the Scandinavian lines of Narwick-Lulea and of Frondjhem-Geffle. This dependence exacts some prudence.

In Denmark, in Holland, what will become of the "agreements" by means of which the Allies had obtained a certain limitation of exports to Germany? The "Consenten" (permits) will be seen to multiply with the con-



venience of the authorities, decidedly turned against us. Thus our enemies will be allowed to get again in detail what we thought we had taken away from them "en bloc."

Denmark, for example, will be seen to import refrigerated meat for the subsistence of her population; and we can make no objections to that. But, at the same time, sheltered from our sight and investigations, she will transport to Kiel, to Lübeck, to Warnemünde, the fine animals on the hoof which are produced in abundance by that country of rich pastures and scientific stock-raising. Double advantage; to satisfy Germany, whom she fears, to the detriment of the Allies, whom she does not fear, and realize very appreciable profits.

In short, all these neutrals, producers on the one hand, intermediaries and "intermediate shippers" on the other, will strive more than ever, aroused by resentment over their menaced interests, to make our enemies benefit by all the means of a most ingenious contraband.

\* \* \* \*

But that is not all. Our enemies themselves will not remain inactive and they will soon profit by the revulsion of feeling that will occur among the neutrals outraged by the new measures of blockade at a distance.

It is probable that submarine war will be resumed in the North Sea with exasperated violence and that, unfortunately, with the favor and clandestine support of the coast populations of the neutral states bordering that sea. A glance at the map will indicate the facilities German submarines will find on indented coasts, near which are many islands. There are "caches" everywhere in which, in the first months of hostilities, they had established shelters and bases of supply.

We may count on an unscrupulous use of the blind and terrible engine, the automatic mine. Already, in all German brains, has been the scheme of making the sea untenable for everybody, since it is by the sea that the enemies intend to reduce the great nation elected to govern Europe.

The effects of aerial war are not comparable to submarine operations. But we may expect in that time a recrudescence of operations with the sole object of destroying and killing.

\* \* \* \*

What is to be concluded from all this? It seems that we have been caught on the horns of a dilemma. Either we shall draw the blockades tighter and expose ourselves to inextricable difficulties with the neutrals and to a doubling of destructive fury from our dangerous adversary, or we shall leave matters *in statu quo* and then that adversary will continue to be supplied from the north; that means the indefinite prolongation of the war. (I have not forgotten, of course, that the Central Empires can draw supplies from Turkey in Asia, but it is a resource inferior to expectations).

I hasten to say that my choice would be in favor of a tightening of the blockade. Any-

thing is better than the present situation. Enough of snares and delusions, enough of that timorous policy which makes one wonder if it is pacifist or bellicose and which makes us the laughing stock, not only of our enemies, but of the pretended neutrals who favor them, enriching themselves the while!

But in reality, the dilemma does not really exist. To get out of what might be thought an impossible situation, there is a perfectly clear solution and one that is sufficiently exposed by our discussion. It is *the effective blockade*. It is the *entry of the Allied Fleets into the Baltic*. Let us suppose such a blockade adopted and put into effect. All objections of the neutrals must fall flat at once. We exercise our full and absolute "droit de suite," since we have an effective blockade. And, moreover, we show at last decision, energy and force. Now, force is always a justification, even for those in the wrong. I may add that, at the same time, the dark operations of submarine war become impossible or, at least, much more difficult, deprived as they are then of the material support of the neutrals. The submarines can be blockaded in their basin by nets and special mines, defended by flotillas of light boats.

It remains to be demonstrated, of course, that the forcing of the Danish straits is a practical operation, but I submit that it may well be considered. For my part, I am certain that London has long ago drawn up plans for the attack of the German intrenched naval camp, the "Kieler bucht," while at Rosyth, the splendid British squadrons are all ready to pursue the execution of it—and with what brave joy after such painful inaction!

See also

CORONEL, BATTLE OFF

### OPERATIONS ELSEWHERE

Little news of significance comes from the far-distant theaters. Turkish troops appear to have somewhat the best of the Russians in Persia, in the region of Hamadan. In Arabia, the revolutionists under the Sherif of Mecca have made some headway against the Turkish authorities.

#### Arabia

Feb

In southwestern Arabia, Aden, an important city near the entrance to the Red Sea, is said to be menaced by a large force of Arabs, accompanied by a few Turkish regulars. Aden has been very strongly fortified, and British reports claim it is in no danger. About the middle of February a British detachment was reported to have been cut off and annihilated near Aden.

March

"On the Yemen front, in the far-off southwestern part of Arabia, there has been a battle between British and Turks. The Turkish reports relate with much detail the story of a large British force some thousands strong, composed of cavalry and infantry and artillery, which met a severe defeat in the

**EUROPEAN WAR—Continued**

region north of Aden. Fighting several rear-guard actions, the Turks say they drove the retreating army back to the coast, where it found refuge under the guns of warships anchored in the Gulf of Aden. Several days later there was a brisk cavalry engagement near the same town and the Turks say they won this fight, too. British reports speak only of a cavalry reconnaissance, in which they lost five killed and thirty-five wounded. Whatever the real facts may be as to the character of the fighting and the losses, it becomes evident that there are strong Turkish forces threatening the British in the region of Aden."

*July 20-Aug 20*

"In Arabia the Turkish town and fort of Yembo have been taken by an Arab force. Yembo is the Red Sea port of Medina. The Grand Sherif of Mecca, who revolted in June, has now defeated Turkish garrisons at Mecca, Jeddah and Yembo."

**German East Africa**

With German Southwest Africa, the Kamerun, and Togoland all conquered, German East Africa is the only colony left to Germany in Africa. Tabora, on the main east-and-west railroad, has been strongly fortified to resist attack by using big guns taken from the *Königsberg*, and 4000 whites and 30,000 natives have been armed to resist British invasion.

This country, almost twice as large as Germany, is being invaded from Nyassaland on the south and British East Africa on the north, where General Smith-Dorrien's forces were assembled, while an armed flotilla is operating on the west, where long Lake Tanganyika forms most of the dividing line between the Kaiser's colony and the Belgian Congo.

**March**

In East Africa, British forces, under Lieutenant General Smuts, have had a lively fight with a German detachment entrenched in the Kitovo Hills west of Gavevta. Some of the positions changed hands several times, but the British finally triumphed when a bayonet attack near midnight enabled two columns of South African infantry to secure a strong foothold in the trenches. A cavalry column meanwhile succeeded in cutting off an enemy detachment in the foothills northeast of Kilina Njaro. A third column, under General Stewart, marching from the direction of Longido, threatened the rear of the German concentration and the whole German force is now in retreat.

**April**

The British expedition commanded by Gen. Jan Smuts has won an important victory at the Kitovo Hills, near the northern boundary of German East Africa. After five days of fighting (Mar 7-12) the Germans "retreated to another prepared defensive position in the forest along the Ruwu River. The pursuing columns had a number of skirmishes in the bush on March 19, 20 and 21, and on the night of the 21st repulsed a strong counter-attack. Meantime a strong force of South African

mounted troops made a night march to a point on the Pangani and established themselves on the hills southeast of Kahe in contact with the Germans. The Germans were strongly reinforced, but finally had to abandon their positions and retire southward along the Tanga railway. The British captured a 4.1 gun which had been part of the armament of the destroyed cruiser *Königsberg*."

General Smuts later reported a victory by mounted troops under General Venderverter, in a surprise attack in the Arusha region. The German forces are supposed to total about 3500 Europeans and 16,000 native police.

The Portuguese have made their first effort in the war by occupying Kionga, on the border of German East Africa.

**May**

In Africa, the British expedition into German East Africa continues to progress. Lieutenant General Smuts, the commander, reports that mounted troops have attacked and captured Umbugwe (or Kothersheim) and Salanga. The Germans in some force were encountered near Kondoa Iranga on Apr 17, and were defeated, retreating southward, and abandoning the town and some munition convoys.

Later in the month, the Germans assumed the offensive, and after accomplishing a concentration of their forces attacked the British under Gen. Jan Smuts near Arangi, in the heart of German East Africa. Several determined assaults were repulsed with severe losses.

Belgian troops on Apr 19 captured German positions at Shangugu, on the border of German East Africa. They continued to the south of Lake Kiou, and on Apr 22 occupied another German post at Ishange, and still later Kigali, the capital of Ruanda. Colonel Molitor is the leader of this expedition; the fighting is the first reported in this region since last October.

**May 20-June 20**

In German East Africa a combined movement of British, Belgian and Portuguese forces is slowly forming a ring around the Germans. General Smuts, the Boer commander of the South African forces, is driving the Germans along the Usambara railway, in the northeast corner of the colony. The Germans have retreated as far as Mkomasi. Three Belgian columns have penetrated 125 miles, as far as the River Akanjaru. Portuguese reports mention a battle with the Germans on their frontier, but no details are given.

**June 20-July 20**

The British army of invasion is making steady progress in this great German colony. After penetrating from the northeastern frontier last spring, past the towering Mount Kilimanjaro, 19,700 feet high, to Moshi, the inland terminus of the German railroad from Tanga, General Smut's force split into three columns. One has moved west to Arusha, the second a hundred miles overland south to Kondoa, the third has fought its way east along the railroad. Tanga, the coast terminal, fell into British hands on July 10, and the entire rail-

road is lost to the Germans. With their islands in Lake Victoria Nyanza captured by British gunboats, with Belgian columns operating on their western frontier and another English force coming down from Uganda, the Germans are losing, bit by bit, their grip on this rich country. Their final stand will probably be made at Tabora, where they have built a stronghold fortified with guns from their warships.

Warfare in Africa has its picturesque qualities. The following is a recent despatch from the front:

"Gen. Smuts and his staff were held up by lions near Kilimanjaro, German East Africa. They were obliged to sit in automobiles all night firing revolvers.

July 20-Aug 20

The various commanders—British, Belgian, and Portuguese—report satisfactory progress in closing the net around the German forces in this last of German colonies. The north-east corner of the country has been won by General Smuts, against no slight obstacles, and with it the Usambara railroad. The Germans in this sector have retreated toward Urangi. Colonel Molitor's Belgian brigade has covered 300 miles, starting from Uganda, and has occupied the western end of the Central Railroad. The lakes that bound the colony are dominated by Allied vessels. Portugal closes the ring on the south, and leaves no neutral adjoining territory. Some of the guns, landed from the cruiser *Königsberg* have been captured by the invaders, whose entire success appears to be simply a matter of time.

Sept

The battlefronts in east Africa are changing rapidly. Gen. Smuts' force has advanced, driving the enemy before him, a distance which, if measured from Verdun, would place him within a hundred miles of Berlin. He is now close to the Central Railroad, and reports having driven the Germans into the Uluguru mountains. Many towns have been captured, including the important seaport of Dar-es-Salam on the railroad, the fall of which was announced on Sept. 4.

The Belgian troops of Colonel Molitor have made equally notable advances in the west, having occupied altogether an area three times as large as Belgium. After severe fighting Sept 1-11, they succeeded in capturing Tabora. This indicates that the work of the Allies is well nigh complete, for it was expected that the Germans would make their last stand at this inland stronghold.

Oct

Lisbon reported Oct 31 that Portuguese troops in German East Africa have defeated the German forces, captured Newala, and taken a large quantity of guns and other war material.

### The Kamerun

Jan

The German Kamerun colony, in Africa, which was attacked on three sides in August, 1914, held out till February, 1916, though there were scarcely 2000 Germans in the colony. The conquest was accomplished by a joint

British and French force which followed up the two railroad lines from the coast. On Jan 1, 1915, they took Younde, the last tenable post in the interior.

"Active operations are now practically ended, and the conquest of Kamerun is complete, with the exception of the isolated position of Mora Hill. The German commandant, Zimmermann, succeeded in making his escape into Spanish territory."

March

With the surrender of the isolated German garrison at Mora Hill, the Kamerun has been entirely occupied by the French and the British.

The Allies have now conquered 730,000 square miles of German territory in Africa, according to a recent announcement in the British House of Commons.

### Tripoli

June 20-July 20

"In Tripoli, Turkish reports allege that the Italians have suffered a severe defeat near the town of Mitratah, on the Mediterranean. A large force of Ottoman volunteers captured several thousand Italians."

### —Aeronautics in

See

AERONAUTICS—PROTECTION AGAINST AERONAUTIC ATTACK

AERONAUTICS—USE OF IN EUROPEAN WAR

DIRIGIBLES—USE OF IN EUROPEAN WAR

JUTLAND, BATTLE OF—DIRIGIBLES IN

### —Ammunition

[Notes on the War Concerning Ammunition. Editorial. *Artill. Monatshefte*, July-Aug. '15. 1800 words.]

According to Russian reports, the Germans are using position guns firing high explosive shells in the trench warfare.

An official French report on June 17, 1915, states that over 300,000 artillery projectiles were fired by them in one day's fighting north of Arras. Total weight of metal is therefore nearly 100,000,000 lbs., requiring fifteen railroad trains for transportation. Compare this with the 32,249 rounds fired by the French at St. Privat in 1870.

Enough trinitrotoluol to supply herself and all her allies is being made in England. Over 300 private concerns are engaged in the manufacture of ammunition.

It is reported that during the last battles at Lemberg, the Russians used Japanese artillery. Many accidents occurred, both guns and ammunition failing to function properly. The American ammunition did not arrive in time.

Smokeless powder requiring over 3½ million bales of cotton has already been expended in the war. Du Ponts calculate that in the last naval fight in the North Sea, smokeless powder equivalent to 4500 bales of cotton was expended in a nine-hour engagement. Another report gives the amount of powder expended on the first bombardment of the Dardanelles as equivalent to 50,000 bales of cotton. Before the war the consumption of smokeless powder was equivalent to 123,000 bales of cotton annually. The total consumption of all the powers is now no doubt in

**EUROPEAN WAR—Continued**

excess of 3,000,000 bales for smokeless powder. It is estimated that 15,000,000 bales of the last cotton crop will be used to manufacture explosives this coming year.

As is well known, Germany obtains nearly all her high explosives from the distillation of coal tar products. In this respect, her chemical industries have been developed to a high state of efficiency. The Italian chemist, Dr. Gina, emphasizes the necessity of Italy now developing this industry in order to manufacture phenol and toluol for explosives. Formerly these explosive chemicals were imported from Germany.

[Notes Concerning Ammunition. Editorial. *Artill. Monatshefte*, Sept-Oct, '15. 350 words.]

The French report that they have at no time fired shell manufactured in the U. S.

During the fighting in Bukowina, the Russians made use of ammunition supplied by the Japanese. It is stated that its action was so poor and uncertain that the Russians went back to old deteriorated ammunition of the year 1904-05.

It is reported that England is making arrangements to purchase the entire artillery matériel and equipment of Portugal. Portuguese arsenals are said to be working on English orders.

Reports on the serviceable life of guns show that in Austria some light field howitzer batteries have fired from 3000 to 4000 rounds per gun, and a 15-cm. battery has fired 1500 rounds without suffering in accuracy.

The French are working on a 38-cm. howitzer which has not yet appeared on the battlefield, but which is said to surpass the German 42-cm. howitzers.

[Expenditure of Ammunition. Editorial. *Artill. Monatshefte*, Jan, '16. 400 words.]

The Austro-Hungarian Minister of War has stated that in the first 17 months of the war the Austro-Hungarian armies have expended 15 billion small arms cartridges and 12 million artillery projectiles of all calibers. The Austrian infantry therefore has used in one day as much as the German infantry used in the entire Franco-Prussian War.

See also

**EUROPEAN WAR—MUNITIONS AND MUNITION MATERIALS**

**—Ammunition—Consumption**

[Consumption of Artillery Ammunition. From Witnesses at the Front. *La Guerra y su Preparación*, May '16. 500 words.]

In France all the metallurgical and chemical industries have been utilized in the manufacture of ammunition. In consequence, the daily production of projectiles has risen to the number of 120,000. In Artois, during the month of May, the Germans reported having received 1,500,000 rounds. In Champagne, during four or five days, more than a million shells were fired against the German trenches; and even so only the 75 mm. piece had reached the standard of supply desired. What is wanted

is to fire without the slightest concern with respect to consumption. To-day the field artillery may do so, but apparently the heavy pieces must count their rounds. An officer of artillery, serving on the Champagne front, reports that between the Grange de Beauséjour and Massiges, that is on a front of about 4 km., there were exactly 72 batteries of different calibers. These great figures should cause no astonishment. All the old pieces possible have been employed in the artillery action on the front. As during this action any piece must fire slowly, it follows that pieces of old model are as valuable as the more modern.

[The Consumption of Artillery Ammunition. Reprint from *Memorial de Artilleria. Revista Militar*, July, '16. 700 words.]

The consumption of artillery ammunition is probably the greatest of the many surprises of the present war. In the Napoleonic wars the Prussian artillery but rarely exceeded the expenditure of 40 rounds per gun per day of battle. At the battle of Leipzig the Prussians averaged for each gun 66 rounds per day, the French 89 rounds.

At Solferino the Austrian artillery was massed; about 29 rounds per gun were fired. In 1866, fewer than 100 rounds per gun were fired. The needle gun, perhaps, gave such a superiority to the Prussians in this campaign that they hardly needed the aid of the artillery, at this time largely smooth-bore. In the war of '70 the Prussians consumed an average of 209 rounds per piece, one battery expended 611 rounds, but in no battle did the average expenditure per gun exceed 100 rounds.

In 24 hours the French batteries north of Arras fired more projectiles than all the German artillery in 1870.

In the Russo-Turkish war, the highest average per day was 180 rounds per piece.

In the Russo-Japanese war the guns were not quick firing, yet the consumption exceeded all forecasts. At the Sha-ho, which lasted three days, each piece of Russian division No. 35 averaged 834 shots. At Liao-yang, the average was among the Russian batteries 420 rounds per day per gun. At Taschitschao, the 2d battery, 9th Brigade, East Siberian Artillery fired 520 rounds per piece in one day.

The Balkan war is not cited, although it is the first in which rapid-fire guns were used, because the small proportion of artillery and the necessity for economy in the use of ammunition greatly reduced the consumption.

The amount of ammunition expended in the present war is almost incredible. The English at Neuve Chapelle in 15 days expended but little less than they had in the two years and nine months of the Boer war. The Germans fired 700,000 projectiles in four hours at Przemyśl.

In the great Champagne offensive last September the French fired between 5,000,000 and 6,000,000 shells. An equal amount is said to have been expended by the Germans during the first week of the attack on Verdun. Five million 75 mm. projectiles would weigh 45,000 tons.

The *Petit Parisien* (Mar 17) gave the number of German batteries at Verdun as 108 of 77 and 54 of heavier pieces. The above figures are easier to say than to comprehend.

#### —Ammunition—Supply

##### Canada

[Canadian War Graft. *Independent*, Apr 17, '16. 700 words.]

Canada made a remarkable response to the need of Great Britain in the war, but the support is now threatened by charges of war graft. It is alleged that war contracts have been manipulated so as to return heavy profits to favored ones, and that fuse orders have been placed with companies which had inadequate facilities, and delayed deliveries were the result. The matter will be investigated by a Royal Commission.

##### Great Britain

[The War in Europe, *Army & Navy Jour.*, Nov 27, '15. 200 words.]

The *London Times*, persistent critic of the British Ministry, says that in the recent drive in Flanders there were undoubtedly blunders of detail in staff work, and failures in supports, but there was no lack of ammunition. The British gunners had all the shells they wanted and more. This shows the success of the work of the Ministry of Munitions. 1200 factories are working under its supervision, perhaps 150 or 200 more than this by now, employing more than a million workers of both sexes.

#### —Ammunition—War Orders for in U. S.

[Rushing American Shells for Big Drive. News item. *N. Y. Evening Post*, Dec 30, '15. 1500 words.]

Within a week or two after Jan 1, factories in the United States will reach the maximum production in shells, about 200,000 a day. Transportation arrangements are being made so that there will be no interruption or delay in shipments. Large shipments of horses are now going forward to the Allies. Practically every cargo boat now leaving port carries horses, often in hastily provided accommodations. A few weeks ago, automobiles were being shipped in large numbers. The shipments of shells at the rate of 6,000,000 a month are expected to go forward now regularly as long as they are needed. Shells are of all kinds. The French government recently placed an order for 8.2-inch and 11.4-inch shells with the Midvale Steel Co. Most of the orders for big shells are of more recent date than for the 3-inch shrapnel.

Almost all the shells shipped lack the time fuse. These are made abroad. Fully half the shells are reported to be shipped with no explosive charge. It has taken a year for our manufacturers to reach this production of 200,000 shells a day, and even so it is estimated that this will be not more than 10% of the amount manufactured by the Allies themselves.

[Note. *Army and Navy Jour.*, Jan 1, '16. 75 words.]

The Midvale Steel and Ordnance Co. announced Dec 27 that the company had contracted to furnish the French government 400,000 shells ranging from 8½ to 12 inches, all to be delivered in 1916. The price was \$30,000,000.

#### —Artillery in

##### See

ARTILLERY—USE OF IN EUROPEAN WAR

ATTACK—FRONTAL

(Article: "How May the German Line be Pierced?")

FIELD ARTILLERY—USE OF IN EUROPEAN WAR

#### —Asphyxiating Gases, Use of in

##### See

ASPHYXIATING GASES—USE OF IN EUROPEAN WAR

#### —Casualties

##### See

EUROPEAN WAR—LOSSES

#### —Causes of

[A Holy and Necessary War. By Major C. Licomati, Infantry. *Rivista Militare Italiana*, Feb, '16. 7000 words.]

(A recital of Austria's crimes against Italy, to remind Italian soldiers that they have a century-old score to wipe off. In the course of this paper it is pointed out that):

The acquisition of Trieste and Fiume would assure to Italy the following advantages:

1. The elimination of the danger of throttling Italy's economic, maritime, national, and political interests in the Adriatic.

2. The elimination of the danger threatening Italy's advance in the Balkans.

3 and 4. Elimination of certain dangers affecting commercial and fishing rights at the head of the Adriatic.

5. Increase of national wealth by several billions.

6. Opening of new markets to Italian manufacturers.

7. Great future of Italian marine in the Adriatic.

8. Absolute dominion over the Adriatic, economic, naval and military.

9. Absolute security of the frontiers.

10. Position of commercial superiority in respect of the countries of Central Europe.

11. Supremacy of merchant marine in the Adriatic.

(These various headings are elaborated by the author.—Ed.)

#### —Cavalry in

##### See

CAVALRY—USE OF IN EUROPEAN WAR

#### —Condition of Belligerents

[War and Peace. *The Army and Navy Gazette*. Dec 11, '15. 1000 words.]

The air is thick with rumors. Most of them are unsubstantial. For some of them, Ministers themselves are responsible; they have prophesied with untoward results. It is widely assumed that they have inside knowledge, and their predictions are given undeserved weight. Mr. Churchill is the worst offender. He told the country in June that at

## EUROPEAN WAR—Continued

the Dardanelles our forces were separated by only a few miles from such a victory as the world had never seen. Nine months before, he declared that if the German fleet did not come out and fight it would be dug out. After both of these predictions had failed to fructify, he informed the world through the Navy League on Trafalgar Day that the Grand Fleet would decide the fate of warring nations. It is very injudicious for persons in positions of responsibility to anticipate events which the country can only hope and trust will come to pass. Lord Robert Cecil said at Croydon, Sept 9, that we were within a little of success at the Dardanelles; after three months that "little" still remains. Mr. Asquith said in the House of Commons on Nov 2 that General Nixon's force was within a measurable distance of Bagdad. Perhaps now the Prime Minister would say that he had been disappointed over the Mesopotamia expedition, as he was over the landing at Suvla Bay. Mr. McKenna has also spoken of victory as assured. He says it is almost a matter of mathematical calculation as to how long Germany can fight. Her defeat is certain, declares the Chancellor. We agree, but not if "disappointments" continue. Victory cannot be organized that way. Mr. Birrell, speaking at Bristol, Dec 5, made the suggestion that Cabinet Ministers and Members of Parliament were to set an example of economy. Nothing has come of this.

It would be far better if Ministers exercised a wholesome restraint in this respect. The Allies will be stimulated by a knowledge of facts, but utterances such as these can neither increase faith in their rulers nor confidence in ultimate victory.

Another crop of rumors revolves around the talk of peace. Few want a continuance of the war, but there are fewer who would not regard with anxiety and apprehension a premature and inconclusive peace. It would be a prelude to another war, which is just what the Germans are aiming at at the present time. It will be time to talk peace when we are assured it will be permanent. The danger is that peace talk may inspire unjustified confidence. It is the same with the premature belief that we can starve Germany into surrender. There are no solid indications that the Germans are losing heart. Why should they be with fresh announcements of victory every day? From this point of view, what have the Allies gained since the battle of the Marne for all the blood and treasure they have sacrificed? The "blockade" of the Order in Council of Mar 11 has brought stringency to the German people, but it has not lessened their power to put armies into the field and provide them with munitions.

There can be no peace of a permanent nature, as a French publicist said, until Germany is rendered harmless by being broken into small pieces. When peace is dictated in Berlin it must be on such terms as to make it decisive and lasting. In this direction, Mr. Arnold White last Sunday wrote "When peace

commissioners are appointed let us beware of giving power to plenipotentiaries other than seaman, soldiers, men of business, and labor men. The political lawyers will give us away."

[A Trial Balance of the War. Editorial *Independent*, Jan 3, '16. 1800 words.]

The European war has resolved itself virtually into a siege of the territory of the Teutonic Allies. A besieged place may yield to assault, through failure of ammunition, through depletion of the garrison by casualties, and through starvation. All these methods are being tried by the Allies.

All efforts of the first class have failed so far, and there is no evidence of weakening of the lines of the Teutonic Allies. The latter have pushed the besiegers back in many directions, but have never broken through the investing line. Russia has been pushed back 250 miles, with an actual shortening of the Teutonic lines, though supply is more difficult. So far as assault goes, the Germans seem able to hold their lines indefinitely in Russia against odds of four to one, the Austrians on the Italian front against three to one, and the Germans on the western front against two to one.

There is little sign of failure in the Teutonic ammunition supply. Cotton is undeniably needed, and rubber is lacking, but substitutes are possible and may have been found. Gasoline supply is assured by the recovery of the oil fields of Galicia. Coal and iron supplies are augmented by the occupied mineral territory on the western front.

The Allies have an ample population to draw on for men. Will the Teutonic supply hold out? In Germany, 840,000 young men come of military age every year. This is greater than the number killed in the first year. Statistics of wounded are not definitely enough known to determine whether the Teutonic armies have been numerically weakened. Bulgaria and Turkey offset Italian numbers.

The Teutonic Allies have gained ground in Europe, but Germany has lost her colonies.

The war is primarily a contest between Germany and Great Britain. Germany has won on land, and Great Britain has won on the sea. The triumph of the British navy is complete. The commerce of Germany has been swept from the sea absolutely, and even commerce through neutral ports is controlled by Great Britain. Means have been found to circumvent German submarines. But British operations on land have not been successful.

Such are some of the visible signs, but there are many unknown factors. Some unforeseen circumstance may determine the issue.

[The Year 1916. *Armee Zeitung*, Jan 6, '16. 500 words.]

Inspired German sources dispute that there is any official approval of the conditions upon which the Central Powers would entertain peace proposals, as published in a recent Swiss paper.

A lesson may, however, be drawn from the article in question. We are still far from our goal, and we must keep our forces up to

strength if we do not wish to sacrifice the fruits of our hard-earned successes. This war is going to the limit. We must cultivate patience and firmness of purpose. The numbers engaged are almost countless, the frontier lines of immense extent, and the war will last a long time.

We desire peace, but only on such a basis as will be worthy of our sacrifices and our efforts. A second wish is that after our great toil and sorrow, after our gloriously gained triumph, we shall return home to a well regulated and unified Fatherland.

[The War on Land. By a Military Officer. *Army and Navy Gazette*, Jan 22, '16. 1800 words.]

On the western front the most noticeable feature is the continued increase in our (Allied) artillery power, especially in large caliber guns. Those returning from France now sound a new note of optimism. The Allies are gradually but very slowly gaining a distinct ascendancy in artillery, and it is claimed that the German infantry is below the former standard.

The Canadian soldiers are great fighters, and they are not slow to criticize. It is among them that the hopeful spirit is most prevalent.

[The War on Land. By a Military Officer. *Army and Navy Gazette*, Feb 19, '16. 2000 words.]

(In this discussion of operations, the correspondent concludes that the Teutonic offensive is caused by the adoption of compulsory service in England, though he admits that this may seem far-fetched. Other reasons are the necessity for a demonstration of military power for political reasons and effect on neutrals, and the large masses of Russian troops which are being trained as rapidly as possible.)

[Army Waste of Labor. *Canadian Military Gazette*, Apr 11, '16. 300 words.]

One of the War Agricultural Committees in Canada has made a strong protest against the present high wages paid to civilian and unskilled labor in connection with military works. The committee claims that these unnecessarily high wages attract men away from the farms and also remove the incentives on the part of the women to take any share in the farm work.

The unskilled labor employed in various military works could be reduced by thirty to forty per cent., and this reduction would not only result in a great saving for the government, but would also make available at once a great many men for work on the farms.

[The War and the Merchant Marine. Review. *Mem. de Ingenieros*, Apr, '16. 700 words.]

(A review of the commerce of the European nations at war. Deals especially with the efforts France is making to supply her commercial needs.)

[The War on Land. By a Military Officer. *Army & Navy Gazette*, Aug 19, '16. 2500 words.]

[This article is a summary of the operations of the week. Certain observations only are abstracted.—Ed.]

Failures of offensive returns (on the part of the Germans) may be taken as an indication of increasing deterioration in the quality of the troops. It is not meant that the Germans have no good troops left, far from it; but we are increasingly often coming up against units of little value.

The Germans hold a reserve of their best troops in hand in case of a local disaster. If, using second best troops, they can render our advance very slow, they feel that they will have succeeded, for then they will have first-class troops in reserve to use against us when we are exhausted.

[European War, Echoes of. (Continuation). Predictions and Facts. By Jose Paulo Fernandes, Captain of Artillery. *Revista de Artilharia*, June, '16. 5000 words.]

(A brief summary of the principal changes in territory of the leading nations of Europe in the past century, brought about as a result of war or revolution, followed by a rapid estimate of the situation of each of the belligerents as to resources at the present time, with the prediction of the defeat of the Central powers through exhaustion of these resources before the end of 1916.)

[France and Germany—1870 and 1914. By Capt. H. M. Johnstone, R. E. Retd. *Journal of the Royal United Service Institution*, Aug, '16. 5000 words.]

(A comparison of the preparedness of the two belligerents then and now and of their strategical and tactical methods when actually in the field.)

See also

EUROPEAN WAR—MILITARY SITUATION  
GREAT BRITAIN—MILITARY CONDITIONS IN  
Germany

[The War on Land. By a Military Officer. *The Army and Navy Gazette*, London, Mar 18, '16. 2000 words.]

Where the masses of troops for the Verdun adventure come from is naturally not to be learned from any of the belligerents. Unofficial reports and guesses of commentators speak of large units being drawn from the Russian front, of many heavy batteries coming from the Italian frontier, of German troops brought from the Balkans, and even of Turkish regiments traveling to north-eastern France. Other reports, on the contrary, say that German soldiers are replacing Bulgars on the Greek frontier, and the *Morning Post* has a story of a letter captured on an Austrian prisoner telling of the great influx of German troops into Galicia and Volhynia, and promising a startling development there in the near future. In fact, no satisfactory theory can be gleaned on this matter, but there is little reason to believe that the

**EUROPEAN WAR—Continued**

chief enemy is yet so short of men that he was not able to obtain from the interior of Germany the 300,000 troops which have come to the aid of the couple of army corps that were sitting around Verdun before the preparations for the great blow. He is using his 1916 class, and using it up in a manner that accords perfectly with the desires of the Allies. As long as he can collect men for the attack we are perfectly willing that he should throw them in, for we know our time is coming.

[The Appointment of General von Hindenburg. By Hilaire Belloc. *Land and Water*, 7 Sept, '16. 1600 words.]

The dismissal of General von Falkenhayn from supreme command of the German Armies, and his replacement by General von Hindenburg is purely a political matter. The defensive strategy of the Central Empires was taken over entirely by Berlin after the blunders of 1914 had rendered victory impossible. This defensive strategy was connected with the name of Falkenhayn, who had succeeded the defeated Moltke in the supreme command.

Verdun and the Trentino were desperate efforts to obtain a decision before things should change. The Trentino failed. Verdun turned out a bloody defeat and caused much criticism and complaint in the German army. There were critics who said that the west had been unduly reinforced at the expense of the east and that trouble would follow. The tremendous success of Brussilov in June gave color to such criticism, and the launching of the great offensive on July 1 added weight to it. By Aug 1 it was clear that the whole defensive scheme with which the name of Falkenhayn was associated had fallen in ruins.

The Emperor summoned Hindenburg simply because his name was the name long idolized by the civilian population of Germany. The presence of Hindenburg in nominal command would mean nothing but for the very able man who is his Chief of Staff, von Ludendorf. It is to be presumed that von Ludendorf will do whatever remaining work has to be done even at this eleventh hour to obtain an inconclusive peace.

The really essential thing to remember is that *no difference in personalities, no changes in command, or even policies, can now seriously affect the situation.*

[The Nations at War. How Strong Are the Germans? By Arthur Bullard. *The Outlook*, Oct 18, '16. 4500 words.]

How many soldiers are left at Hindenburg's command? The information available to neutral nations makes an answer to this question very largely guess-work. Even the Swiss, with better facilities for learning the truth than any other neutral observers, differ by a half million in their estimates of the German reserves, and by 30 per cent. in their estimates of the rate of attrition.

The Entente nations are securing unity of

action, and the Central Powers are practically encircled and besieged. By the plan of operations which they must presently disclose, the strength of the reserves of the Central Powers will become known with considerable accuracy.

The minimum demand on the Teutonic forces—that of defending the line now held—is being met. But the entrance of Rumania makes it necessary to go to the relief of Bulgaria. If Russian pressure against Bulgaria develops and no relief is sent by Germany it means that the Teutons have no strategic reserve. This condition will be revealed by developments in the direction of Sofia.

The Teutonic Powers can win the war only in France. An offensive with probably half a million men against Verdun failed. It will take a strategic reserve of about a million men to take the offensive in France with a good chance of success. If there is no new and powerful attack in France before Christmas, it will be because the Teutonic strategic reserve is too small—i. e., less than a million.

A strategic reserve of less than a million could best be employed in the east, and a campaign down the Pruth offers the best field for the employment. If the attack falls in this locality, it will indicate a strategic reserve of four to seven hundred thousand men. If the attack merely serves to hold the Russian forces in position and prevent the invasion of Bulgaria, the former figure is indicated. If the attack sweeps on to the Black Sea, the larger figure is indicated.

These moves must come soon if at all. Next spring the Allies will be stronger and the reserves smaller. By Christmas it may be possible to prophesy the date of peace.

**Great Britain**

[What Are Luxuries? Editorial. *Independent*, Apr 10, '16. 1200 words.]

Due to the need of ships to supply the army, and because of a desire to keep money in the country, the British Board of Trade is rapidly extending its list of prohibited imports. Economy is being preached, and in some cases practiced as an example. But the alcohol question is one that no one is strong enough to touch. Any suggestion for the suppression or curtailment of consumption of alcoholic liquors raises a howl from somewhere, and so, with urgent need for economy, the annual drink bill is nearly \$1,000,000,000.

—Cost

[Financing the "Armed Nation." By O. M. W. Sprague. *The Military Historian and Economist*, Jan, '16. 4000 words.]

The cost of the European war already far exceeds the estimates of those who ventured to predict that a war of long duration would be a financial impossibility. Military expenditure has not been restricted, and no exhaustion in the sources of supply is apparent.

Funds have been procured by issue of government paper money, from banks, in the form of banknotes and deposit credits by means of short-term treasury notes, and by loans having a distant maturity.



**EUROPEAN WAR—Continued**

The crisis occasioned by the outbreak of the war, the readjustment of industrial activities, and the expenses of mobilization, were in large measure financed through the banks. In Great Britain, where checks are generally used, there was an unparalleled increase of credit in the form of Bank of England deposits. In continental countries there was an analogous increase in notes issued by the great central banks; and, contrary to the usual contraction of credits following a crisis, the expansion has continued to increase from month to month; not, however, so rapidly as to threaten the breakdown of the credit system. As a result of this credit inflation an abnormally high level of prices has been reached in the belligerent countries.

The exportation of gold has either been prohibited or placed under strict control; and the issue of treasury notes on the outbreak of hostilities enabled the governments to procure funds for the first six months. Government loans in large measure serve to fund expenditures already made and debts already paid with the proceeds of previous issues of short time notes.

In former wars between great nations the funds borrowed by governments seem to have come almost entirely from investors acting upon the same considerations of safety, return and marketability which determine their selections of securities in time of peace. In the present war, owing to the vast numbers engaged, it would seem that if only those motives which, in time of peace induce men to save, were at work, the supply of funds would already have proved wholly inadequate.

Borrowing in neutral countries has been another source of war funds. At present the geographical situation and the control of the sea by the Allies has prevented the Central Powers from making use of the sources of supply in the United States and in the South American countries. However, the credits already secured by the Allies in this way, and those which may be obtained in the future, will cover but a small part of the total military expenditure.

Universal military service brings home to all the impelling duty of supporting the government. Where members of every family are with the colors, those who remain at home cannot but feel the force of the obligation to do whatever lies in their power to strengthen the armies in the field.

It is most unlikely that any country will ever reach the ultimate limit of expenditure in war. A military decision will generally be reached some time before all resources are made available. A country will reach the point of military exhaustion, either for lack of available men for the field or for lack of ability to manufacture or otherwise procure material, long before financial exhaustion begins to be felt.

Both the military and financial experience which has been gained during the present war would seem to strengthen the case of those who hold that wars between great nations are

to an increasing extent economically disadvantageous. Universal military service and the technique of modern war make for long drawn out contests.

*Austria*

[Austria. Finance. *Information*, Dec. '15.]

"It was announced from Berlin, Nov 20, that subscriptions to the third Hungarian war loan reached 2,000,000,000 crowns (\$400,000,000), or 900,000,000 crowns more than the second war loan."

*Germany*

[Germany. Finance. *Information*, Dec. '15.]

The first comprehensive statement of the extent of the three war loans floated up to Nov 1 by Germany appears in the weekly report of the American Association of Commerce and Trade in Berlin. It appeared that the final result of the third war loan had been a subscription of 12,101 million marks, or approximately \$2,880,038,000. The following table further sets forth the sources from which the three war loans, totalling over six billion dollars, had been drawn:

Where signed:

	Third loan	Second loan.	First loan.
At Reichsbank:			
	\$135,422,000	\$134,470,000	\$114,002,000
Bankers and banks:			
	1,026,888,000	1,348,032,000	689,010,000
Savings banks:			
	616,896,000	470,764,000	210,154,000
Life insurance companies:			
	99,246,000	91,392,000	48,314,000
Credit associations:			
	161,840,000	86,204,000	.....
Post offices:			
	39,746,000	26,656,000	.....
	\$2,880,038,000	\$2,156,518,000	\$1,061,480,000

This table does not contain subscriptions received from soldiers in the field.

It was announced in Berlin Nov 29 that in the middle of Jan, 1916, Germany would launch a fourth war loan, totalling about 10,000,000,000 marks (\$2,500,000,000).

The amount paid in cash by subscribers to the third German war loan up to Nov 23 was 10,091,000,000 marks, or 83.4 per cent of the total, according to Berlin advices of Nov 27.

See also

*GERMANY—FINANCE**Great Britain*

[How Britain Pays Her War Bills, Editorial. *Review of Reviews*, Dec. '15. 1000 words.]

Great Britain faces the problem of paying war bills at the rate of \$22,000,000 a day, and this sum may mount to \$30,000,000 a day, twelve times the peace expenditure. The extra amount must be raised by borrowing the savings of the people, or by increased taxation, and is being done by both. Even with the increased taxes, current revenues cover only one-ninth of the expenditure, so it will take eight years of peace to pay for each year of war, with the war taxes continued.

**EUROPEAN WAR—Continued**

(Note.—The additional taxes imposed are recited. These are given in another article in this issue of the *Digest*. See "Speeding the Silver Bullets.")

[Great Britain. Finance. *Information*, Dec, '15.]

Including the new vote of credit the Premier indicated, Nov 10, that the total amount allotted for war purposes would be £1,662,000,000 (\$8,310,000,000). He presented figures showing that the government had a sufficient sum left over from the previous vote to finance the war to the third week of November.

The approximate daily cost of the war between Sept 12 and Nov 6 was given by Mr. Asquith as £4,550,000 (\$21,750,000). It rose to this figure from £2,700,000 (\$13,500,000) in the earlier part of the financial year.

Loans advanced by Great Britain to her allies and dominions between Apr 1 and Nov 6, Mr. Asquith said, amounted to £98,000,000 (\$490,000,000). In the same period £23,000,000 (\$115,000,000) were expended for food supplies and miscellaneous items.

The main causes of increase in the cost of the war, Mr. Asquith continued, were the great expenditures for munitions and the advance to Great Britain's allies and dominions. He could hold out no hope that there was any immediate likelihood of a decrease in those two items. On the contrary, they were likely to increase.

The House of Commons, Nov 11, formally agreed to a vote of credit for £400,000,000 (\$2,000,000,000) asked for by Premier Asquith.

["Speeding the Silver Bullets." By Lewis R. Freeman. *Review of Reviews*, Dec, '15. 3000 words. Illustrations.]

(Note.—This and similar articles are digested on account of the information they contain concerning the financial side of war, an important feature of present and future conflicts.—Ed.)

"Silver bullets" is a phrase referring to contributions and subscriptions in financial support of the government, the provision of the wherewithal to make war. The first financial measures of the British government were based apparently upon a brief war, and were inadequate as events proved. Certain additional taxes were imposed but the main reliance was on a loan of \$1,750,000,000. In May, 1915, a new loan had to be faced, but now the question of increased taxation could no longer be deferred. A loan exceeding \$3,000,000,000 was floated without difficulty, but grave problems had to be solved in distributing the new taxes now to be imposed. The working classes were already disturbed, but one of the immediate effects of the war was to improve labor conditions and banish unemployment. Wages were better and the money was spent freely, but for foreign luxuries like phonographs, cuckoo clocks, dress, and the like.

War expenditures mounted to \$15,000,000

a day in July, 1915, and to \$20,000,000 a couple of months later. In September, Mr. McKenna presented his epochal budget, providing in general for an increase in the income tax to approximately 10% on incomes from \$600 to \$5000 per year, up to 25 to 35% on incomes of \$20,000 and upwards; for a special tax of 50% on all trades and manufactures whose profits had been increased more than \$500 by the war; an increase of 50% in the duties on tea, cocoa, coffee, tobacco, and dried fruits; of 100% on motor spirits and patent medicines; a new ad valorem tax of 33 1-3% on automobiles, motor cycles, cinema films, clocks, watches and musical instruments; and considerable increases in postal, telephone, and telegraph rates. No new taxes were imposed on alcoholic liquors, as the people will probably not be ready for such a step for a year or so.

Prof. W. R. Scott, President of the British Association, believes that Great Britain can finance indefinitely a war costing not over \$5,000,000,000 a year, but this would be a maximum effort, and would leave no room for public or private extravagance. Following the German idea, a "war-savings" campaign may be expected in Great Britain before next spring.

But the war is costing more than \$5,000,000,000 a year, and the expenditure by spring may reach the rate of \$11,000,000,000 a year, so that even with the maximum effort, a loan of \$5,000,000,000 or more a year will be required. This may be accomplished for possibly three years, but some time the breaking point will be reached. Then, if the war is still to be continued, must come a "capital tax," a general liquidation of private property for State ends, and such a contingency has been thought of, but it would probably not be resorted to till after the war is over.

Germany has floated a war loan which she expects to repay by a war indemnity, failing which a capital tax may be necessary.

The Anglo-French loan was floated in the United States at nearly 6%, while the British loans were floated at 4½%, but money is normally higher in New York, and business conditions made the demand for money abnormal. Mr. Asquith said that a final hundred million pounds might decide the war. Mr. McKenna is gaining in prestige, and the honor of raising the final sum may fall to him.

[Note. *Army & Navy Jour.*, Apr 8, '16. 300 words.]

In a speech to the House of Commons on Apr 4, the Chancellor of the Exchequer assumed that the war would last another year. New taxes of nearly \$325,000,000 were proposed and accepted without question or surprise. The taxes are necessary to defray the cost of the war, now estimated at \$25,000,000 a day. The actual deficit for the last year was \$6,110,000,000, and the national debt at the close of the financial year was \$10,700,000,000. Among the new taxes proposed is one on matches, estimated to yield \$10,000,000 revenue. Table waters, amusements, and

railroad tickets should be taxed, and the taxes on motors and on incomes should be greatly increased.

See also

#### GREAT BRITAIN—FINANCE

##### Russia

[Economic Organization of Victory. By V. Monastirev. *Voenny Sbornik*, May, '16. 4000 words.]

Russia has borrowed the following sums of money in order to finance the present war:

- a) in London, during 1914 and 1915 1,500,000,000 ru.
- b) in France, during 1915 ..... 200,000,000 ru.
- c) in other foreign markets, in 1914 and 1915 ..... 2,900,000,000 ru.
- d) interior loans up to 1915 ..... 6,300,000,000 ru.

Total ..... 10,900,000,000 ru.

These amounts have been increased during the present year by additional loans bringing the total up to 16,794,999,872 rubles.

It is interesting to note the effect of these large loans on the actual supply of money in the country as shown in the following table:

	July 29, 1914	Oct 8, 1915
Gold money .....	1,604,000,000 ru.	1,632,000,000 ru.
Paper money .....	1,718,000,000 ru.	4,990,800,000 ru.

The great increase in paper money tells its own story as to the state of the country's credit. Nevertheless, this credit has held better than might be expected. Notwithstanding that in addition to the loans mentioned above there has been established a credit in the United States of 5,500,000,000 rubles through arrangements made by France and England, the issue of the Russian loans has been made at the successive rates of 97½, 98½ and 99 with a constant rate of interest. Contrast with the experience of Great Britain which issued its first war loan at 95 with an interest rate of 3½ per cent., which was raised in later loans to 4½ per cent. and then to 5 per cent.

If we turn our attention to German loans the amounts subscribed by various municipalities and firms to successive loans, upon examination are found to be constantly increasing, as shown in the table below:

	1st Loan	2nd Loan	3d Loan
Hamburg marks—	215,000,000	390,000,000	460,000,000
Frankfurt "	148,000,000	328,000,000	455,000,000
Düsseldorf "	115,800,000	280,000,000	468,500,000

The lesson to be drawn from this exhibit is undoubtedly that the Germans are paying subscriptions to one loan with the proceeds of the preceding one.

#### Manufacturing Conditions

At the beginning of the war Germany succeeded in seizing a very large part of Belgium and a very valuable part of France. In the latter were three-quarters of the coal resources and four-fifths of the metallurgical resources of that country. With these resources at their disposal the Germans accumulated an extraordinary amount of ammunition, while on the other hand, England was experiencing a serious deficiency in this regard. In the spring and early summer of 1915, the English awoke to the great and urgent need for a greater production of ammunition, and, appointing a minister of munitions, set ear-

nestly to work to remedy the existing state of affairs. Both financial and manufacturing resources were to be mobilized with the single viewpoint of organizing victory. At the present time the English nation is just about prepared to reap the fruits of its labors. And in addition it has taken steps to co-operate with its allies in this regard, and more especially with Russia.

#### Switzerland

[Notes of the War. *Army & Navy Jour.*, Dec 11, '15. Quoted.]

"An official statement issued recently at Bern shows that Switzerland has paid \$51,000,000 up to the end of October to preserve her neutrality. It is estimated by the Swiss Treasury that if the war continues as it has until two years have been completed the cost of the Swiss army will be from \$70,000,000 to \$80,000,000. This will make it necessary for Switzerland to raise \$8,000,000 in excess of her ordinary annual revenue.

—Dirigibles, Use of in

See

#### DIRIGIBLES—USE OF IN EUROPEAN WAR

—Diseases in

[Notes of the War in Europe. *Army & Navy Jour.*, June 10, '16. 200 words.]

The Medical Research Committee of the National Insurance Act has been called by the War Office to assist in an investigation of the question of the prevalence of "soldiers' heart" in the British Army. Sir James Mackenzie, a leading British medical authority, reports that "soldier's heart" is not heart disease as that term is commonly understood. Fresh, air, recreation and exercise play an important part in the treatment. The Military Hospital at Hampstead has been selected to grapple with the problem.

[Naval and Military. The Delay at Saloniki. *Scientific American*, Aug 19, '16. 100 words.]

A correspondent has recently received a letter from London saying that typhus is epidemic in the territory before Saloniki and there would be no forward movement of the Allied troops until the epidemic was under control. This is a possible explanation of the failure of the Saloniki forces to join in the general offensive.

See also

SHELL SHOCK  
"TRENCH FOOT"  
TUBERCULOSIS

—Engineering—Field Operations

See also

ENTRENCHMENTS  
RIVER CROSSINGS—IN EUROPEAN WAR

—Espionage in

See

ESPIONAGE—IN EUROPEAN WAR

—Finance

[War Finance and American Business. *The Journal of Political Economy*, Feb, '16. 9000 words.]

(The substance of an address delivered, without manuscript, at the meeting of the

**EUROPEAN WAR—Continued**

Western Economic Association, in Chicago, Nov 27, 1915. The author holds that the present financial situation is acute; that, primarily, the dangers are those of England's policy; and that, although there is hope for a change, there is no prospect of any improvement.—Ed.)

**—Food and Commodity Prices and Supply**

[Germany's Food Problem and its "Kontrolle." By John Hilton. *The Nineteenth Century*, Jan, '16. 8500 words.]

(In this article the author challenges German efficiency in respect of the German food problem. When the war broke out, the elements of the situation were two, curtailment of consumption and increase of supplies. But the German government, failing to see this, took the problem to be one of prices: apparently there was "no one to point out that high prices were a natural deterrent, harsh but effective, to consumption, and at the same time a powerful incentive to increased production, and that the enforcement of artificially low prices would tend to defeat both these vitally important ends." The administrative attempt to regulate both supply and demand by fixing prices is set forth, and its results are described. After twelve months of price regulation, food was 70% dearer than before the war, and it is not impossible that if the food situation had been left to develop in accordance with natural laws, the problem would have solved itself in a much more effective and advantageous way.)

See also

**EUROPEAN WAR—RAW MATERIALS OF WAR****Austria**

[News Item. *Armee Zeitung*, Jan 20, '16. 100 words.]

A peasant from the suburbs of Vienna was recently fined \$50 for having fed oats and barley to a hog, in violation of published regulations. [This is an evidence of the severity of the regulations for the conservation of the food supply.—Ed.]

**Germany**

[The German Food Supply Problems. *Holland Gazette*, Nov 5, '15. 700 words.]

The Berlin correspondent of the *Handelsblad* states that new and improved regulations governing the food question have been issued by the Federal Council. These regulations required careful consideration, but minor measures did no good.

The first measure governs the distribution of potatoes and fixes the maximum price. Municipalities have been authorized to seize 20% of the crop grown by producers cultivating more than one hectare. It remains to be seen whether this 20% will be sufficient. The Government declares the potato crop a record one; the Agriculturists' Union calls the crop a "good average."

In meat distribution, no measures governing private houses have been promulgated. Regulations apply to restaurants, butcher shops, and other places of sale. They are

as follows:—On Monday and Thursday only boiled meat may be sold in restaurants. Roast meat is forbidden, with the object of saving fat. On Tuesday and Friday neither butcher nor restaurant owner are allowed to sell meat or dishes containing meat. Fish is allowed. The object is a saving of meat. There are no restrictive measures for Wednesday and Sunday. On Saturday no pork may be sold in restaurants. Housewives are expected to observe the days without meat and fat and to voluntarily submit to the regulations, which are compulsory for others.

If the well-to-do merely buy a double supply on the day before each meatless day, the regulation will not be effective and the government will have to resort to meat tickets and maximum prices.

Butter now costs 61.7c. per lb. in Berlin. If the cost of butter, bread and flour falls off and the rations of these are somewhat increased, the reduced meat consumption will not be hard to bear.

[A Food Dictator. *Independent*, June 5, '16. 700 words.]

The food situation (in Germany) is alarming. This is proved by the extraordinary measures taken. The Minister of the Interior was allowed to resign on account of ill-health, and will probably be succeeded by Dr. Helfferich, now Minister of Finance. A Department of Food Supply has been created with Herr von Batocki at the head. He is given practically unlimited power, subject to final approval by the Federal Council, in all matters of food except for the Army. He is empowered to seize and dispose of all foodstuffs and fodder in the Empire and to regulate sales, prices, transportation, importation, exportation and consumption, and extending to all the states.

Bread tickets and the use of potatoes in bread sufficed for 1915, but the harvest that year was short 9,000,000 tons in cereals. Cattle and pigs had to be slaughtered for lack of fodder. Thus the grain situation was solved, but meats and fats are running low. It is believed that the situation can be tided over by suitable means of distribution to all classes. The southern states are better off for food than Prussia. Conquered territory is being planted.

**—Forces Engaged**

[An Estimate of the Armies. *Independent*, Apr 3, '16. 1200 words. One table.]

A table is republished from the *Journal of the Union of Democratic Control*, London. This is supplemented by comments based upon information from various sources. The computations are made to determine the status on Jan 1, 1916.

From the information available, it appears that Russia had 6,200,000 available in June, 1915, and has added 3,200,000 since. Her losses have been 2,940,000, which is reasonably verified by a rumored Petrograd compilation of losses for 1915. France had 3,600,000 available in June, 1915, and has added 750,000 since. The best evidence puts the losses at

1,560,000. Great Britain had 1,500,000 available in June, 1915, and has added 1,400,000 since. The losses have been 347,000. Italy had 1,400,000 in June, 1915, and has added 500,000 since. The losses have been 220,000.

Germany had 4,850,000 available in June, 1915, and has added 1,800,000 since. The losses are placed at 1,423,000. Austria had 2,650,000 available in June, 1915, and has added 1,800,000 since. The losses have been 1,128,000. Turkey had 500,000 available in June, 1915, and has added 700,000 since. The losses are given at 130,000. Bulgaria had available about 450,000, and her gain and loss were respectively 50,000 and 46,000.

The losses mentioned represented the killed and missing, plus 20 per cent. of the wounded estimated as permanently disabled, plus 5 per cent. assumed as sick or temporarily incapacitated.

(From the data given, it appears that all the belligerents are stronger in numbers on Jan 1, 1916, than in June, 1915, with the single exception of France. Belgium, Serbia, and Montenegro have also suffered diminution in strength, but their numbers are inconsequential among such totals.—Ed.)

[Russia, the Ultimate Decisive Factor in the War. Editorial, *Scientific American*, June 17, '16. 900 words.]

In the opinion of a former (U. S.) army officer of high rank, who has been abroad most of the last two years, Russia will finally be the decisive factor in the war. The French and British can hold until Russia is organized and equipped. France has 4,000,000 (nearly) men with the colors. Great Britain has 1,600,000 in France and 2,400,000 elsewhere. Of those in France, 1,200,000 are holding a 60 to 70-mile stretch of the front, and nearly a half million are massed back of Verdun.

The Central Powers are fighting on a 2000-mile front, and the losses reach an enormous figure. In the end it will be the shortage of men that will be a serious factor.

Germany is getting stronger in munitions. Starting with 50,000 machine guns, she now has 75,000 in spite of large losses. She aims to provide one machine gun for 20 men on the front line. The Allies aim at 32 machine guns per 1000 men. Russia is far behind this ratio, but gaining. She has 9,000,000 men under intensive training, 5,000,000 being only indifferently equipped. Equipment is being manufactured at home and received from abroad.

[Note. *Army & Navy Jour.*, Aug 12, '16. 200 words.]

An army officer just returned from Europe, where he had exceptional opportunities to secure information, estimates that Germany has 4,000,000 men with the colors and Austria 2,500,000. France has 3,500,000 with the colors and 2,000,000 recent levies under instruction. In May, 1916, England had 1,600,000 men in France.

### Germany

[Notes on the War. The Total German Resources in Men. *Scientific American*, Dec 4, '15. 200 words.]

An estimate of 12,000,000 men has been made as the total number the German Empire was prepared to put into the field. It is generally agreed that a nation is able to mobilize about 10% of its population, but a supreme effort, utilizing some elements not fully fit, may raise this percentage to 12. The French General Staff calculates the German maximum at somewhat above 8,000,000, based upon what the French themselves can do with a population equally healthy.

[Table of German Recruitment. By Hilaire Belloc. *Land and Water*, June 1, '16. 3200 words. One table.]

(The writer concludes that the manpower of the German Empire had been called upon in its totality by the end of last year, and that there now remain available nothing but the lads who grow up as the war proceeds.)

In December, 1915, class 1917 was called for service. The class 1918, more than half of whom are not yet eighteen years of age, may have been already warned and will at any rate be warned soon. Behind them, at a year's intervals, comes the class 1919, and so on.

But the wastage of this war is many times more rapid than the recruitment available from the younger classes. 1918 may be used before the end of the year. Allowing for the necessary very numerous exemptions among such young boys, it will not furnish more than 400,000 individuals and probably less, and they will be of exceedingly poor quality.

The German wastage per year is not 400,000, nor twice or even four times that figure. It is more like six or seven times that figure. The year by which a class in a conscript system is designated signifies the year within which a man attains his twentieth birthday. The army that invaded France and won at Tannenberg included class 1913, but not class 1914. The men of class 1914 were called up in November and December, 1914, after the first three or four months of war. The German system is to train these recruits for a comparatively short time before they are fed into the fighting units. It is a system which the French copied, discovered to be a weakness, and rapidly abandoned, substituting for it a much longer period of training.

The class of 1915 was not called up until May, 1915. The process of calling them up lasted into June. At this point, the end of the first year, counting classes 1914 and 1915, all "normal" methods were exhausted. In August and December, 1915, classes 1916 and 1917, respectively, were called up. Men have now been summoned for auxiliary duties who are really invalids.

["The Organization for War" of the German Army. By Sune Bergelin. *Svensk Artilleri-Tidskrift*, Part 5, 1916. 3900 words.]

## EUROPEAN WAR—Continued

(The peace organization of the German Army immediately before the outbreak of this war and a detailed description of the number, character and organization of the various "units" that have been organized since then. Data obtained mainly from the official *promotion and loss* lists. Not susceptible of ready abstraction.)

[German Propaganda. By Hilaire Belloc. *Land and Water*, Aug 24, '16. 2500 words.]

The general plan of the German propaganda is to create a universal sentiment that the war can now no longer reach a definite conclusion one way or the other and that therefore a prolongation of hostilities is a useless expense of blood and treasure. Since Brussilov's advance and the Somme offensive, the agents of the propaganda have renewed their activities with peculiar vigor. In the *Los Angeles Times* of July 25 is published a statement purporting to come from "a high military authority in Washington" to the effect that the total losses of the German army in a year are only half a million and that therefore the normal rate of recruitment amply makes up for casualties. Compared with this enormity, the statement in another part of the paper that Verdun will certainly fall on Aug 1 is almost negligible.

The bureaux which are at work upon such propaganda prepare statements less crude for European consumption. They maintain, however, that the German Empire possesses a reserve of man-power amounting to 2,000,000 men for drafts to support the armies in the field.

Now that it is clear that there is no such strategic reserve, the 2,000,000 men have taken another form, and we are now told that the figure includes a hypothetical Polish army and class 1919.

Actually the two classes of 1917 and 1918 make as a reserve not yet drafted something over 600,000, but less than 650,000.

The recovered wounded may bring the figure up to 900,000. There remain the prisoners who by replacing labor release men for service. The presence of prisoners has enabled Germany to mobilize something like 9,000,000 men instead of about 8,000,000, but its effect on mobilization has long been past. Stretch the real figures even and a million of reserve men for drafts between this and next summer cannot be found. By impressing the Polish population Germany could gain another half million at least. It is the business of the Allies by a sound international diplomacy to make that impossible. The Allies should declare positively for the *full establishment of Poland*.

Of resources within herself, Germany has not a million able bodied men in reserve.

## Great Britain

[Notes of the War. *Army & Navy Jour.*, Dec 11, '15. Quoted.]

To the 3,000,000 men England has enlisted in land and sea forces, as stated by Mr. As-

quith, should be added, according to the calculations of a Canadian correspondent of the *Evening Post*: "Approximately, and speaking from memory: Regular army and reserves (exclusive of the Indian native army), 400,000; territorials, 300,000; native Indian professional army, 150,000; navy, 250,000; in all 1,100,000 men; a grand total of 4,100,000. In addition to this, Canada contributes 250,000 men, of whom 200,000 are actually raised, Australasia 200,000, South Africa, 100,000, and other colonies various numbers." This makes a total of 5,000,000 men, of whom 4,000,000 are raised by the mother country. Another correspondent of the *Post* calls attention to the fact that: "According to official reports, ninety per cent of the wounded Germans return to active duty completely cured. This percentage should be deducted from the total losses. There are many cases of men who have been wounded twice and cured, and who are now in the field again. They have figured twice in the casualty lists, but represent no losses at all." The method of determining the number of German casualties by taking as the basis of the computation the list of casualties published officially is misleading, as the lists contain many corrections of previous reports and are therefore repetitions. The Berlin *Militär-Wochenblatt*, which we receive regularly in spite of the war, publishes in each number, under the heading of "Unser Helden" (our heroes) a list of officers killed, but no lists of wounded officers or of either killed or wounded among the enlisted men. The names of these officers are grouped under their respective organizations, but no places or dates are mentioned, and nowhere in the publication are the Teutonic casualties given in detail. We have found no reports of German casualties that appeared to be worthy of confidence and no reliable reports of any other casualties than those of Great Britain, which we have published from time to time.

[Has Recruiting in Ireland been Satisfactory? By "Outis." *United Service Mag.*, Aug, '15. 3500 words.]

In estimating Ireland's part in the war, account should not be taken of reservists and soldiers with the colors when war broke out. These men merely went where duty called them, and have borne a valiant part.

The total of Irish recruits up to the end of the third week in March, 1915, was 51,000, of a total of more than 600,000 males between 18 and 38, shown by the 1911 census. "To sum up, there is no doubt that up to the present (April, 1915) recruiting in Ireland, generally, has been disappointing." Conditions in Ireland are described as unsatisfactory.

[Enlistment in Ireland. *Army and Navy Gazette*, Jan 22, '16. Quoted.]

It was stated in the House of Commons on Jan 10 that the number of men between nineteen and forty-one in each of the provinces of Ireland on Aug 15 last was estimated at:

Leinster .....	174,597	Munster .....	136,637
Ulster .....	169,489	Connaught .....	81,393

Up to Dec 15 there had enlisted in the army and navy, according to periodical returns compiled by the police, which, however, could only be looked upon as approximately accurate, the following numbers:

Leinster .....	27,458	Munster .....	14,190
Ulster .....	49,761	Connaught .....	3,589

[The British Front. *Independent*, June 26, '16. 1000 words. Map.]

There has been much speculation as to why the British Army remains inactive with the French and Italians hard pressed and the Russians active. To create a diversion, Neuve Chapelle (Mar, 1915) and Loos (Sept, 1915) have been the two British offensives, both checked without much advance. Incompetency of officers and deficiencies of numbers and of munitions have been alleged, but the latter deficiencies have been removed. (A map shows the probable composition and distribution of the German forces on the British front.)

Colonel Churchill criticises the large proportion of non-combatants. Each of 200,000 officers has a servant. In the House of Commons he stated that half the nation's strength is at home and half abroad. Of the half abroad, only one-half fights. Of the half that fights, only three-quarters are behind rifles on the firing line. Thus it takes six soldiers recruited to get a rifle on the firing line. He advocated measures to put a greater proportion of men at the front, and to secure a more equitable distribution of dangerous duty. With probably 2,000,000 men who have never been under fire, men who have been wounded, some severely, are being returned to the front.

The inaction is with the consent of the Allied council in control, and the British forces will strike at the appointed time. Indications are that this will be soon.

See also

CANADA—ARMY

GREAT BRITAIN—PERSONNEL

—Fortifications, Experience with in

See also

BARBED WIRE ENTANGLEMENTS—USE OF IN EUROPEAN WAR

BELGIUM—FORTIFICATIONS

FORTIFICATIONS—FIELD—EXPERIENCE WITH IN EUROPEAN WAR

FORTIFICATIONS—PERMANENT — EXPERIENCE WITH IN EUROPEAN WAR

NAVAL OPERATIONS—ATTACK

(Article: "The Failure to Capture Cattaro and the Dardanelles")

—Fortifications, Use of in

See

FORTIFICATIONS—FIELD—USE OF IN EUROPEAN WAR

FORTIFICATIONS—PERMANENT—USE OF IN EUROPEAN WAR

—Individual Experiences in

[Going to the Front. Translation by F. E. Battaglia of an extract from the book *En Campagne*, by Marcel Dupont. *Rivista di Cavalleria*, Nov, '15. 8000 words.]

(A graphic account in considerable personal

detail of the experiences of a subaltern officer in going to the front to join his regiment. The railroad journey is touched upon. At the date, Aug 28, 1914, information as to conditions at the front was fragmentary. As he neared the front confusion became apparent, tho in some respects somewhere near normal conditions of life went on.

The engineer of a returning train told of the French retreat. The thunder of guns was heard. Wounded began to come back from the front. Then the author found the commissary officer of his regiment and plied him with questions. Detraining, he set off across country. Fugitives were encountered, and he passed into the zone of active fighting, and encountered some of the dead. He then, in approaching headquarters, came under shrapnel fire, and ducked.)

—Infantry in

See

INFANTRY—FIRE—IN EUROPEAN WAR

INFANTRY—USE OF IN EUROPEAN WAR

—Losses

[Concerning Statistics of Losses. By Maj. Gen. v. Richter, German Army. *Artill. Monatshefte*, July-Aug, '15. 2500 words.]

The unexpected conditions and developments in the various theatres of operations in Europe make it very difficult to determine positively the proportion of losses due to the different arms. In trench and position warfare, the importance of artillery becomes greater. As long as troops remain in their trenches, the losses are local and in general small. When troops leave their trenches for the attack, they will come under artillery shrapnel fire and suffer heavy losses. Not until they have advanced close to the defenders' trenches do they come under infantry and machine gun fire, because the defenders are usually compelled to stay under cover by the hostile artillery. For the defense, the conditions are therefore more advantageous, because they need not expose themselves until the fire of the hostile artillery endangers its infantry and is suspended. The moral effect of artillery fire, especially of the high explosive shell of heavy artillery, is very shattering and nerve depressing.

On the French front, the conditions are greatly in favor of the defense, and compel the attack to suffer enormous losses in attempting to break through. On the Russian front, however, the conditions have favored the attack. This is due to the fact that the operations involve a combination of battles of maneuver and of position. Other contributing causes are the inferior quality of the Russian troops, their lack of artillery and ammunition, and the failure to prepare in advance properly fortified lines of defense.

In all battles of position, the bayonet has given the final decision. Losses due to gas-bombs, grenades, and bombs dropped from air-craft, have also been considerable but difficult to differentiate.

In future studies, it will be impossible to apply figures of average losses. Statistics determined must differentiate not only be-

## EUROPEAN WAR—Continued

tween position and maneuver warfare, but also according to the theatre of operations.

[A Study in Loss Statistics, and Some Conclusions with Reference to the Losses in the World-War. By Major G. af Wetterstedt. *Svensk Artilleri-Tidskrift*, parts 1 and 2, '16. 850 words. 7 tables.]

An attempt is made to arrive at a correct estimate of the actual losses in the present war by comparing the percentage of losses to forces engaged in the different modern wars, as well as by comparing the available statistics of losses and estimates based upon them.

The actual losses are divided into three classes—those due to the arms or weapons; those due to sickness; and those due to being taken prisoner or missing. In the first two classes, a distinction should also be made between *temporary* losses, such as those due to men being wounded or sick and recovering in time to again take part in the war, and *permanent* losses, such as those dead or wounded so seriously that they cannot rejoin the colors during the war. All of the third class may be considered a permanent loss.

## Losses Due to Weapons of War

Even with the great improvements in weapons, the proportional losses in a modern battle are no greater than, if as great as, they were formerly, and due to the improvements in medical and surgical service, a much greater proportion of the sick and wounded recover than formerly.

The different tables give the losses in the opposing armies in several important battles of the Seven Years' War (1756-73), the Napoleonic wars, the Crimea (1854-6), Königgratz, Mars La Tour and the Russo-Japanese War. Also the number of wounded that died and that recovered, and of the sick the number that died and that recovered.

The official report of the losses of the British Army up to Nov 9, 1915, in killed, wounded and missing is given as 229,511 men. The losses of German officers up to July 31, 1915, as given out from the German side are: Killed 13,803, wounded 26,826, missing 3347, or a total of 43,976.

The estimated German loss varies very much. One German authority gives it up to the beginning of January, 1915, in round numbers: Dead, 230,000; wounded, 800,000; prisoners, 70,000.

Dr. K. Ziegler, German consul in Denver, estimates the loss up to the middle of February, 1915, to be, in thousands:

	Germany.	Austro-Hungary.	France.	Great Britain.	Russia.	Total.
Killed .....	482	341	464	116	733	2136
Slightly wounded.	760	618	718	185	1500	3718
Severely wounded	97	83	439	49	482	1150
Total losses....	1339	1042	1621	350	2715	7067
Prisoners (miss'g)	233	183	495	83	770	1764
Total .....	1572	1225	2116	433	3485	8831

This is also almost exactly the same as that reported by a Swedish business man as being obtained by him in Berlin last summer.

A British estimate of the effective German loss up to July 31 gives it as about one million men, and an additional half million less seriously wounded.

A Swiss estimate gives the losses up to this time as about 2,180,000 men. A French estimate places the Prussian losses at different periods as follows: to June 1, '15, 1,388,000; to July 1, '15, 1,504,000; to Aug 1, '15, 1,700,594; to Sept 15, '15, 1,916,148; and this does not include the Bavarian, Württemberg and Saxon losses, nor the naval losses. If we add these, the loss in round numbers would be 1,800,000, 1,900,000, 2,170,000, 2,400,000. (This estimate is considered much too high by the author.)

The *Independent* for Aug 2, '15, estimates the loss in thousands up to July 31 as follows:

	Germany.	Austro-Hungary.	France.	Great Britain.	Russia.	Total.
Killed .....	500	355	450	125	800	2230
Wounded .....	900	800	800	250	2000	4750
Total losses....	1400	1155	1250	375	2800	6980
Prisoners (miss'g)	250	200	310	90	800	1650
Total .....	1650	1355	1560	465	3600	8630

The loss due to the different weapons is also investigated, but definite and accurate data for this are not now obtainable. It is thought that greater proportional losses are now due to artillery fire than in former wars. Two reports of French and one of British surgeons gives the proportion of wounded by artillery fire, under their observation, as 60%, 70%, 52%. The moral effect of modern artillery fire, especially by the heaviest pieces, must also be considered; also the effect on the nerves of troops subjected to severe and long-continued artillery fire, which in many cases has caused permanent breakdowns.

## Australia

[Australian Roll of Honor. Australian Imperial Force. Casualties Sustained in Action. List No. 3. *Australian Mil. Jour.*, Jan, '16. 45 pages.]

This list contains an average of about 150 names to the page, and, consequently, recites about 6750 casualties. Casualties are given by number, name, and organization, and are classified as killed in action, died of wounds, wounded, missing, and died. In some cases, men are accounted for as prisoners of war. Neither localities nor inclusive dates are given for the casualties.

## Canada

[Notes of the War. *Army & Navy Jour.*, Dec 11, '15. Quoted.]

Casualties to date among Canadians are estimated as being near 17,500, about 17,000 of which were suffered by the 1st Division. The great bulk of the losses were sustained at Ypres, Festubert and Givenchy.



## Germany

[The German Losses. *Arms and the Man*, Dec 9, '15. 1200 words.]

Writing in the Nov 20 number of the *New Republic*, Mr. Gerald Morgan deduces the fact that the Germans can continue at their present strength until the campaign of the year 1917.

Using statistics compiled, for the most part, by "F. F." [Col. F. Feyler, of the Swiss Army.—Ed.], the military critic of the *Journal de Genève*, he finds that the portion of the male population of Germany between the ages of 20 and 45 in 1915 was 13,353,364. Since this number was deduced from facts given in the German census of 1910, 450,000 is deducted from it, as representing the number of deaths among men from 20 to 45 since the time of the census-taking. This leaves 12,903,364, and deducting 3,340,000 men unfit for service, and 1,800,000 men at work in the public service, the number of men at Germany's disposal at the beginning of the war is found to have been approximately 7,750,000.

Taking the number 2,640,000, reported officially by Germany as the extent of her losses in the first twelve months, and deducting 33 1-3 per cent slightly wounded and returned to duty, the average monthly loss is seen to be 146,666, or approximately 150,000 men. At this rate the Germans lost 2,250,000 men during the 15 months up to Nov 1, 1915, and of the original 7,750,000 there should be left on that date 5,500,000 men at their disposal.

The German armies, on all fronts, including guards of communication, are estimated at 4,000,000 men. This leaves 1,500,000 to be used in replacing losses. At the estimated rate of loss of 150,000 a month, these would be used up by September 1, 1916. The incoming class of 1916, however, about 520,000 men (650,000 less 25 per cent for death and disability), would enable the Germans to keep their army at its present strength until the campaign of 1917.

Mr. Morgan's deductions are particularly interesting in connection with the opinion, held by so many, that the war will last as long as there are men left in Germany to fight.

[Prussian Casualties. *New York Times*, Dec 22, '15. 200 words.]

According to the *Nieuwe Rotterdamsche Courant*, the total of Prussian casualties, including list number 399, is 2,287,083. There are in addition 234 Saxon, 315 Württemberger and 250 Bavarian lists.

Harold J. Tennant, Parliamentary Under Secretary of War, announced in the House of Commons that the Prussian, Saxon, Bavarian, and Württemberger lists up to Nov 30 numbered 2,524,460 casualties, including 484,228

Russia has iron north of Rostof, near Tiflis, killed or died of wounds, 354,158 severely wounded, 27,674 died of disease, and 381,149 missing.

[German Casualties. *Army and Navy Gazette*, Jan 29, '16. 250 words.]

On Jan 19, 1916, in the House of Commons, the casualties in the German army up to the end of the year, were given as follows:

Killed .....	588,986
Died .....	24,080
Wounded .....	1,566,549
Missing and prisoners.....	356,153

Total .....	2,535,768
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[Germany's losses. Editorial. *Army and Navy Gazette*, Feb 12, '16. 1000 words.]

The question of the German losses is a subject of interest to the allied powers and to neutral nations as well. Germany issues casualty lists, but in such a way as to make calculations based on them of doubtful accuracy.

Whatever civilian opinion may be, soldiers and sailors and practical men are of one opinion—that Germany will only be defeated when she has suffered sufficient losses on the battlefield. Mr. Tennant estimated the German losses to Dec 21, 1915, as 588,986 killed, 24,080 died of wounds, 1,566,549 wounded and 356,153 missing and prisoners. The military correspondent of the *Times* reaches much the same figures and the figures of "F.F." in the *Journal de Genève* are also confirmatory.

These casualty lists take no account of disease. On the western front, the loss from disease is probably small, as it is in the Allied armies. But in the Balkans and on the Russian front, the conditions are very different and much sickness may have resulted if adequate provision was not made.

There is much variation in the estimates of the available German reserves. The numbers that must be kept back for warlike and agricultural purposes and for such trades as must be kept going, are not known. Such men are necessarily deducted from the reserve. They cannot serve in both capacities. The *Times* correspondent puts the reserves at 2,000,000, and "F.F." in the *Journal de Genève* puts them at 2,200,000. The latter considers that the early summer of this year will mark the beginning of a desperate resistance.

[An Estimate of German Losses. Editorial. *Scientific American*, Apr 22, '16. 1000 words.]

*Land and Water* publishes an estimate of the German losses made by the military critic, Hilaire Belloc, and based upon data of an official character gathered by the Intelligence Bureau of the French War Department.

German casualty lists to Jan 31, 1916, give the total dead as 651,768, and to these must be added about 160,000 representing those dead but reported as missing. This number results from comparison of missing with prisoners, the difference being probably dead abandoned on the battle field.

By comparison of official lists with certain private lists of dead (parochial, unions, employers and large clubs), it is found that these lists agree for the first few months of the war, and thereafter the official lists are

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incomplete. Based upon this evidence, the German dead numbered over 1,000,000 to Dec 31, 1915.

A comparison of the German lists of missing with the French lists of prisoners shows that about 70% of the prisoners actually in the French camps are omitted from the German lists.

Based upon the above figures, Mr. Belloc concludes that the permanent loss to the German fighting force to Jan 1, 1916, is over three and one half millions of the original possible recruitment of nine millions.

[German War Casualties. *Army & Navy Jour.*, May 20, '16. Quoted.]

The number of German casualties in the war is placed at 2,822,079 by an official British estimate issued on May 10. The casualties in April alone amounted to 91,162. So far, 664,552 German soldiers have been killed in the war, according to the statement, which reads:

"German casualties, exclusive of corrections, were reported during the month of April, 1916, as follows: Killed or died of wounds, 17,455; died of sickness, 2395; prisoners, 1921; missing, 6217; severely wounded, 14,557; wounded, 4001; slightly wounded, 38,979; wounded remaining with units, 5367. Total, 91,162. These, added to those reported in previous months, including corrections reported in April, 1916, bring the totals reported in German official lists since the beginning of the war to: Killed or died of wounds, 664,552; died of sickness, 41,325; prisoners, 137,798; missing, 197,094; severely wounded, 385,515; wounded, 254,627; slightly wounded, 1,023,212; wounded remaining with units, 117,956. Total, 2,822,079. These figures include all German nationalities—Prussians, Bavarians, Saxons and Württembergers. They do not include naval or colonial troops."

These figures given in the official estimate tend to confirm the French estimate that more than 200,000 Germans have been killed, wounded or are missing in the battle of Verdun. There was little or no fighting of any importance from Jan 19 last, when Harold J. Tennant, Under Secretary of War, announced that the German losses amounted to 2,535,788, until Feb 21, when the Verdun struggle began, so it is probable that the 286,291 German casualties occurred for the most part in the Verdun battle.

[European War. *Information*, July, '16. Quoted.]

German casualties from the beginning of the war to the end of June, as computed from official German lists, are given as 3,012,637. They do not include naval casualties or casualties of colonial troops.

[War Notes. By Captain H. M. Johnstone, R. E. (retired). *United Service Magazine*, Aug, '16. 4400 words.]

A false view of the situation would imply that Germany, with at least 13,000,000 men of

military age in her population, had already been worn down to somewhere about 4,500,000 of these men. If, of the 13,000,000, three belong to the two categories of indispensables at home and of unfit, 10,000,000 remain. Deduct 1,000,000 or 1,500,000 for the soldiers that have up to date been put permanently out of action by death or disablement, and there still remains available a very large body behind the 4,000,000 or 5,000,000 noted as being along the fronts and in immediate support. Moreover, each year produces from 600,000 to 700,000 fresh young men who attain military age.

[European War. Losses. Germany. *Information*, Oct, '16. Quoted.]

German casualties in the war during the month of August, according to a British compilation from the German casualty list, totaled 240,900. This brought the German total since the beginning of the war, as compiled from the same sources, to 3,375,000. These figures include all the German nationalities, but do not include the naval and colonial casualties.

Detailed figures for Aug, 1916:

Killed .....	42,700	Wounded .....	153,500
Prisoners .....	1,800		
Missing .....	42,900	Total .....	240,900

Period of war to end of Aug, 1916:

Killed .....	832,000	Wounded .....	2,144,000
Prisoners .....	165,000		
Missing .....	234,000	Total .....	3,375,000

**Great Britain**

[British Casualties. *New York Times*, Dec 25, '15. 200 words.]

Premier Asquith announces the British casualties to Dec 9 as follows:

	Killed.		Wounded		Missing.	
	Offic.	Enlistd.	Offic.	Enlistd.	Offic.	Enlistd.
France and Flanders	4829	77,473	9943	241,359	1699	52,685
Dardanelles	1667	24,535	3028	72,781	350	12,194
Other Theaters	871	10,548	694	10,953	100	2,518
<b>Total</b>	<b>7367</b>	<b>112,556</b>	<b>13,665</b>	<b>325,093</b>	<b>2149</b>	<b>67,397</b>

Classified without respect to grade, the numbers are—killed, 119,923; wounded 338,758; missing 69,546; grand total, 528,227.

(Note.—In the two principal theaters, the proportion of killed to wounded is approximately,—officers 1 to 2; enlisted, 1 to 3. In the minor theaters, the killed have exceeded the wounded among both officers and enlisted. The percentages are, killed, 22.7%; wounded, 64.2%; missing, 11.1%.—Ed.)

[The War in Europe. *Army & Navy Jour.*, Jan 15, '16. 100 words.]

The Parliamentary Under Secretary of War (Mr. Tennant) stated in the House of Commons that British casualties at Loos and in accompanying actions from Sept 25 to Oct 8 were 2378 officers and 57,288 men. Of this total, 11,000 officers and men were killed and 9000 missing. The gain of ground was scant and mostly recovered by the Germans. These facts are sufficient to account for the recall of Gen. French.

[European War. *Information*, July, '16. Quoted.]

Casualty lists issued by the War Office showed that during June the British Army lost 423 officers killed, 1032 wounded, and 64 missing—a total of 1519. They showed for the first three weeks of July 1108 killed, 2834 wounded and 491 missing, a total of 4433. This made the aggregate loss of officers since the beginning of the war 33,857, of whom 10,105 were killed, 21,290 wounded and 2462 missing.

[German Casualties. *Army & Navy Gazette*, Aug 19, '16. 400 words.]

Only the Germans and ourselves [British] regularly publish lists of losses. The German lists may probably not include all their losses in all theaters, but up to the end of July the casualties reach a total of 3,135,177, about one-fourth of their available men. But of these probably half have rejoined the colors, and should be deducted to ascertain the effective loss. The German lists admit 157,975 men as prisoners. An Austrian list of prisoners lost would be interesting.

[Somme Drive Has Cost Britain 307,169 men. *N. Y. Times*, Oct 1, '16. 250 words.]

The British casualties for September are reported as 5439 officers and 114,110 men. This is smaller than the August total of 127,945. The figures for July were 59,675, thus giving a total of 307,169 casualties for the three months covering the Somme drive.

#### —Losses—Aeronautical

[Aeronautics. Teuton Air Losses in the War. *Scientific American*, May 20, '16. 200 words.]

Among the latest estimates of German air losses is that by the *Giornale dei Lavori Pubblici*, which states that Germany has lost 47 Zeppelins and 368 aeroplanes, with 1400 air-men killed or captured. Germany has constructed 40 new Zeppelins, of which over 30 are in service. Austria is said to have lost all her dirigibles and 184 aeroplanes. These figures are two months old and are higher than the usual estimates. They do not include the late heavy tolls claimed by the Allies.

#### —Machine Guns in

See

MACHINE GUNS—USE OF IN EUROPEAN WAR

#### —Matériel—Accidents to

[Notes on the War Concerning Accidents due to Defects in Matériel. Editorial. *Artill. Monatshefte*, July-Aug, '15. 500 words.]

On the dreadnought *Queen Elizabeth*, the breechblock of one of the 15-in. guns was blown out, as a result of which this ship was out of commission for some time. It is believed that such guns cannot endure the test of such protracted use as occurred in the bombardment of the Dardanelles.

It is reported that on the plateau of Lavaron an Italian howitzer was destroyed by premature burst of the shell.

While experimenting with air bombs, Capt. Soames, of the English Aviation Corps, was killed.

Disastrous explosions have been reported in the ammunition factories at Hounslow, near London, at Montreal in Canada, and at Marseilles, France.

#### —Military Lessons of the

[The War in Europe. *Army & Navy Jour.*, Nov 27, '15. 150 words.]

Alexander Powell, war correspondent, arrived in New York Nov 9, bringing 22,000 feet of film taken by the French government, showing something of the recent Champagne fighting. He mentions the use of steel helmets, respirators, faces and hands smeared with vaseline as a protection against acids, knives for close fighting and hand grenades.

[First European War Report. *Army and Navy Register*, Dec 18, '15. 600 words.]

The first of the reports to be made by official military-naval observers in the present war is that of Surgeon A. M. Fauntleroy, U. S. Navy.

The part of the report devoted to military organization and equipment gives, among other things, a description of weapons and projectiles used in the war.

Interesting among these are the minenwerfer, or trench mortar, of the Germans, and the steel dart missiles of the French aviators.

The minenwerfer is a weapon resembling in construction the catapult and is light enough to be drawn by two men. It has a range of 350 yards and throws a shell of 187 pounds containing high explosive.

The steel darts of the French aviators are the size of a pencil, sharp-pointed and grooved to keep them vertical in flight. The darts are dropped from a great height, a thousand at a time, and are said to scatter over an area of 200 square yards.

[Military and Naval Notes Abroad. By J. B. Gautreau (Paris correspondent). *Army & Navy Jour.*, Dec 25, '15. 1800 words.]

#### The New Conditions of Attack

Experience shows the truth of the saying of Gen. Cherfils that "true skill lies in provoking attack by the enemy." The unsuccessful German attacks in Artois and Flanders were accompanied by fearful losses, and the French did not escape severe losses in their advance north of Arras in May-June. The French played a waiting game, believing that time worked in their favor. But the Germans seized the opportunity to hammer the Russian front, to their diplomatic advantage in the Balkans. The French believe they can break through when and where they want to, but they are afraid of the cost. Gen. Joffre has awaited two conditions he deemed essential—command of the air and superiority in artillery.

#### Command of the Air

The French may now claim command of the air, but they are trying to add to their superiority. Their production of aeroplanes is at

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least double that of Germany. Much more powerful aeroplanes have been built, mounting quickfirers and machine guns, with a crew of five, and craft have been designed of the carrying capacity of Zeppelins at one-tenth their cost.

The French were at the beginning superior in field artillery, and the Champagne and Arras actions show them superior in heavy guns. 800,000 men are estimated to have taken part in the battle of Champagne on a front of 25 km. The German losses are placed at 140,000, of which 25,000 were prisoners.

**Rank of Navy of France**

France has been passed in naval strength by the U. S., which will soon rank second, though there is no offset to the battle cruisers of the German navy. France has the most powerful fighting vessels (*Tourville* class—sixteen 13.4-inch guns), and the largest submarine in service (1000 tons).

**The Problem of Anti-submarine Defense**

The best brains in France and Great Britain are working on the problem of defense against submarines. Many defensive measures have been adopted, such as mines, special signal apparatus, dummy warships as baits in minefields, and other measures not revealed. Structural changes have also been made to meet the submarine danger.

[Medico-Military Statistics. *Army & Navy Jour.*, Dec 25, '15. 1000 words.]

(Comments on and abstracts from the "Report on the Medico-Military Aspects of the European War," by Surg. A. M. Fauntleroy, U. S. N., published under the direction of the Bureau of Medicine and Surgery, Navy Department.)

There were in August three British armies in France, aggregating about 1,000,000 men; the Belgian army, 100,000 men; and five French armies of about 300,000 each, plus 100,000 at strategic points in rear of the line.

Although the rifle is still the principal weapon of the men in the trenches, "the machine gun is playing an increasingly important rôle in the conduct of the present war. At the beginning of the war the Allies were markedly deficient in this arm, but at the present time there seems to be no advantage on either side in this respect. Organized rifle fire is directed in various ways according to conditions to be met. Thus we have 'distributed frontal fire' along the entire line of an advancing body of men; 'concentrated fire' on a particular spot for a definite reason; 'oblique fire' from one portion of the trench while the other portion is occupied in the assault; 'enfilade fire' when a trench or a body of men is fired upon from their flank; and 'covering fire' when reserve troops situated on high ground fire on the enemy's trench over the head of their comrades in the front.

"There are several types of grenades in use by the opposing forces which are furnished the troops in the field. In addition to those, the troops themselves extemporize various

kinds from the material to be found at the front. The hand grenade furnished to the French troops is the bracelet type, with firing mechanism, consisting of a ball of cast-iron filled with high explosives, and of a leather bracelet fastened to the wrist. To the bracelet is attached a rope about a foot long, having an iron hook at the end. Just before throwing the grenade the hook is engaged in the ring of wire attached to the friction primer forming a part of the fuse plug which closes the iron ball. Thus when the grenade is thrown the ring of the wire and the friction primer are wrenched off and the fuse is fired. The grenade can be thrown about twenty-five meters and explodes four or five seconds after the primer has been released.

"The German grenade can be thrown by hand or rifle. By hand it is used for a short distance, fifteen or twenty meters. It is composed of a copper rod, to the extremity of which is fixed a cast-iron cylinder filled with a high explosive and grooved in order to facilitate its breaking into small pieces at the moment of explosion. A copper tube, also containing some explosives, is placed in the interior. It is surmounted by a complicated system for closing the grenade and for automatic firing by percussion, which is said by the French to result in a large percentage of misfiring. In quite a number of instances the British troops have hurled back these grenades into the German trenches. Used with the rifle, this grenade has a maximum range of 400 meters. When so used a blank cartridge is placed in the chamber of the rifle and the quantity of powder left in the cartridge is regulated according to the distance to be thrown. The Germans, like their opponents, make use of a large number of extemporized grenades. The assaulting troops carry them in haversacks or strung in a circle of wire around the shoulders or waist.

"Flame projectors are used by the Germans for throwing burning liquid. They are very much like the ordinary portable fire extinguisher in construction, throwing a liquid which at once catches fire spontaneously, and has an effective range of thirty meters. The burns caused by this method are of the deep, sloughing variety, exposing tendons and bones, and are treated with wet dressings until healthy granulations appear. These flame projectors are mainly employed in street and house-to-house fighting, although their use in the trenches has been reported a number of times.

"Hand grenades (bombs) and shells have recently been employed at short range to produce an irritating and an asphyxiating gas upon bursting. Although intended to render portions of the trenches untenable, reports from the front indicate that their action is very variable and much influenced by the presence of wind. The necessarily small quantity of gas that is evolved at the time of bursting has a very restricted local effect.

"Chlorin or bromin gas, compressed to liquid form and liberated from large metal tanks when the wind is blowing toward an opposing trench, has caused very distressing deaths

when inhaled in concentrated form. Being heavy gases, they hug the ground, moving to leeward and sink into the trenches. The first effect is to cause the eyes to water, and this is quickly followed by a violent irritation of the bronchial tract. If troops are unprotected and remain in the trenches, they rapidly develop a capillary bronchitis, with a hyper-secretion of thin watery mucus which fills up the air spaces of the lungs and practically causes death from drowning. Those receiving concentrated doses have died in from one to three hours, sometimes from oedema of the glottis, but principally from exhaustion of the heart in trying to pump the blood through the engorged capillaries surrounding the bronchioles and ultimate air spaces of the lungs. This suffocating process sometimes lasts from one to three days, the younger men with stronger hearts holding out longer than the older.

"The mortality from this form of suffocation depends on the degree of concentration of the gas inhaled and the age of the patient. Many cases have been mild on account of the capricious action of the wind in distributing the gas along the trenches, some parts of the line receiving it in more concentrated form than others. There results an asphyxiating bronchitis in all stages from the grave cases which are cynosed and gasping for breath to those suffering from a mild form of irritation of the bronchioles."

Certain conditions and factors in the present war have relegated the rifle to a comparatively insignificant place. The bayonet has been a weighty factor in carrying a position, though the total percentage of all wounds by thrusting instruments comprises only five per cent of the whole. Pistol wounds are extremely rare, the automatic pistols used showing a marked explosive effect, especially when the bones were involved. The rapid-fire gun is far superior to the rifle for repelling a charge. Field artillery is playing the dominant rôle in this war, though heavy guns are being used, including high caliber naval guns used for land operations.

[A Wells' Prophecy that Came True. *Independent*, Dec 27, '15. 1500 words.]

(Mr. H. G. Wells' 1902 forecast of what would happen to a British army in action against a scientifically organized foe is compared with Mr. Bernard Kellerman's account of the Battle of Loos, Sept 22, 1915, published in the *Continental Times* (Berlin). This abstract is from the latter.)

The German staff officers regarded the antiquated British tactics with open-mouthed astonishment. The British infantry advanced toward the German position in dense masses, eight lines deep in echelon. To the east of Loos, at Hill 70, the British artillery came riding up in the open, the batteries carrying bridging material for crossing the trenches or other natural obstacles. In the distance, in the level plain, one or two regiments of cavalry were visible—Dragoons of the Guard.

Infantry in masses, artillery in the open, cavalry in the background—tactics of a by-

gone age. Generals grow obsolete as rapidly as inventions and sciences.

The British troops carried out the attack with splendid bravery—in this day of mortars, telephones, and machine guns.

The eightfold storming columns were met by combined fire of rifles, machine guns, and cannon. The batteries came to a miserable end. The mortars, notified by telephone, got hold of them swiftly and thoroughly, and they did not even have time to unlimber. The cavalry in the background got salvos of the heaviest shell and drev' back without having unsheathed saber. The attack broke in front of the wire entanglements. The British losses in killed and wounded in this attack may be fixed at at least 20,000. War is not a sport for a few dilettantes.

[War Notes. By Capt. H. M. Johnstone, R. E. (retired). *United Service Mag.*, Aug, '15. 6500 words.]

(NOTE.—This series of articles forms an account of the military operations covered elsewhere in the *Digest*. There are occasional descriptions and discussions embodying some of the military lessons of the war which are of interest. The latter only will be abstracted.—Ed.)

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The curse of modern war is the necessity of literally wearing down the enemy's strength by hundred-yard battles, repeated day after day at scores of points, and carried through by spade and bomb and hurricanes of shell. This character of warfare, with its terrible continuity of strain, is a supreme test of national fiber, of individual courage and tenacity. Formerly there was fighting for a day or two, and then an interval of refitting and marching. Now no single regiment can see the fighting through from beginning to end. Having fought to physical and moral exhaustion, it is replaced and withdrawn for a rest. When it returns to the front it finds the same enemy in the same trench, with an occasional variation of a hundred yards forward or back. The exasperation is extreme, and troops require steady determination.

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At the Labyrinth were found the most formidable trenches encountered in the war. Concrete, steel, dugouts 20 feet deep, enormous number of machine guns—such terms give some idea of the elaboration. The machine guns enable a front to be held by a few men, thus saving casualties in the preliminary bombardment of an attack, and reinforcements are brought up through underground passages when needed, so that they are not exposed to artillery fire at all.

[War Notes. By Capt. H. M. Johnstone, R. E., (retired). *United Service Mag.*, Sept, '15. 5500 words.]

Surprise was the chief weapon in attack in the past, but it is now seldom possible. Barbed wire entanglements and machine guns preclude any sudden attack. The entanglements must be cut and the guns knocked out or

## EUROPEAN WAR—Continued

buried, things which can be accomplished only by a prolonged bombardment. If the artillery preparation has been adequate, the assault may enter the *débris* of the enemy trenches, but trouble is only then beginning. When the enemy sees that the trenches are likely to be lost, he notifies all artillery in the vicinity, and the whole area is subject to a hurricane of shell and shrapnel. In this the victors must work to reverse the position. This is often the costliest part of an attack. In one French attack, it cost 80 casualties to occupy the trenches, but the organization and consolidation cost 1500 more. Every attempt is made to cover this work by artillery fire, but the new positions have no wire entanglements, and a counter attack is a certainty if the position is important. If troops are rushed up to block the counter attack, it means a heavy increase of casualties. In war, death loves a crowd.

The expenditure of artillery ammunition is stupendous. In the fighting north of Arras, 300,000 rounds were fired, costing approximately \$2,000,000.

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The proportion of British staff officers is higher than in other armies. The British organization has four battalions to a brigade, others six, giving three brigade staffs to twelve battalions against two; there are two British divisions to a corps against three for the others, meaning three corps staffs against two for each six divisions; the British have two corps in an army, the others three, four, or five. Thus there are many more staff officers for a given number of men in the British army than in the armies of any of the other belligerents.

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The ratio of officers to men killed has been one to fourteen; wounded, one to twenty-two; and missing, one to forty-five. In the regimental units there is an average of one officer to forty or fifty men.

\* \* \* \* \*

There cannot be too much artillery, and the heavier calibers are essential. The rifle and machine gun have driven the men deep into the ground, and they can only be beaten by sheer pulverization by high-explosive shell. The machine guns must be destroyed or buried, the wire entanglements torn to shreds and the men killed, dazed or buried under their own parapets; and the workshops must be as busy as the guns to make this possible.

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In grenade warfare, the individual counts. The voice of a feared officer can make a unit charge, but it cannot make it fight at close quarters with enthusiasm.

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Much that the aeroplane has done was anticipated, and its function in observation is being neutralized to some extent by crafty artifices in concealment. But the aeroplane as a bomb-dropper is proving of greater value than was expected. Skill in hitting with bombs

is being developed. The aeroplanes now work in large squadrons, and are doing fine work.

[From the Firing Line in Europe. *Army & Navy Jour.*, Jan 22, '16. 1200 words.]

(From a letter from a Canadian officer to Lieut. A. T. Rich, U. S. Army.)

The intrenching tool is of great importance to the soldier, not only in providing cover, but also in keeping it in repair when once constructed. In digging trenches, the soldier is working for himself and for those who follow him.

In high ground, the Turkish type of trench (deep and narrow, with vertical sides) is best. A ledge is left to give means of egress, and frequently a step is cut near the bottom to sit on during bombardment. The character and instincts of an organization are invariably shown by the trenches they leave behind them. The backlash of high explosive shells frequently produces wounds in the back, to the great anger of those thus wounded.

A cap which can be pulled down over the ears like a skating cap is a necessity in cold weather, as are also felt-lined leather mittens. A poncho is a valuable adjunct to the overcoat.

Old rubber sheets and torn sandbags should be tied about the feet and leggings, as they keep out the cold and mud.

The rifle and ammunition should be kept thoroughly cleaned and oiled. The bayonet should fit easily. The most practical periscope is a small pocket affair, 3 x 1½ inches when folded. A metal top opens on a hinge from the metal-backed mirror, on which there is a small clasp. It can be attached to a cane, stick, or bayonet, and placed at the back of the trench.

All movements must be guided by consideration for others. Any exposure attracts fire. Even a shot that will find its mark brings a return fire that may cause casualties among those near by or in rear.

Bayonet work occurs with such frequency that perfection in bayonet exercise is of greatest importance.

Wire cutters are all right for reconnaissance, but wire entanglements must be cleared by high explosive, and no charge should be undertaken until so prepared.

Wounded should be looked after when the work at hand is over. First aid should be applied, or a tourniquet in case of profuse bleeding. A wound should not be washed, as the water will carry impurities into the wound. Iodine is very efficient as a disinfectant of wounds.

The British rifle is a truly terrible weapon, especially in rapid fire. Waterproof covers were issued after Armentières, where the rifles became clogged. The Canadian (Ross) rifle is an excellent target weapon, but not a practical rifle for the field.

It is of extreme importance that men should be able to see, to listen, and to transmit orders and messages accurately. Often there is no other means of transmitting orders to connecting companies except by passing from man to man along the trench or line, and many lives

may be lost through failure to transmit a message or order accurately. The British army has developed special sections of trained runners for messenger service. They are trained in running and in carrying messages. It is seldom necessary to repeat a message to these men.

Men past forty frequently give excellent service, but young men stand the hardships of field service best. Field service in time of peace is the real work in training men to become soldiers.

[The New War. Georges Blanchon. *Revue des Deux Mondes*, Jan 1, '16. 15,000 words.]

## I

This war is going to create a new world; but there is one domain affected by it above all others, that of military technique. It is too soon, of course, for its effect on the art of war to be fully realized; that is still within the realm of the dreamer.

Some one will say: "Why worry about future wars? Is not this one the last? Will not arbitration henceforth replace armed conflicts? If so many fathers of families have left willingly for the field of carnage, it is with the idea of closing the bloody era, and sparing posterity these horrors. The work of to-morrow will be the formation of the United States of Europe and the promulgation of a law of peoples. . ."

Many thought thus in the first days of the war; this generous idea sustained and ennobled them, and it is well that it should have been so; but they are probably less numerous now that human wickedness has been measured.

It appears inevitable that among men energy should be on the side of injustice. It is, therefore, a fatality of human nature that many should be disturbed by the ambition of a single one. In order to annihilate a single disorderly will, there are needed a thousand on the side of order. Why, then, is it that the law of right is so firmly established among individuals? Because the disinterested parties are united by the sentiment of justice. The idea of universal peace presupposes enough distinct interests so that any international conflict leaves outside of the question a large majority of witnesses, who judge it. It necessitates the fractioning of humanity into a great number of peoples free enough to express an opinion, strong enough to support it, united enough to group their action. It is sufficient to enumerate the great powers capable of intervening efficaciously on any given point to see how far we are away from such an ideal.

We are progressing towards it, however. The number of small sovereign states worthy of figuring in the society of nations is growing. The progressive emancipation of colonies introduces new independent moral factors. The rapid peopling of the earth acts in the same direction; it is preparing the fractioning of certain disproportionately large states; it is giving weight to new peoples, like the Argen-

tine Republic, and to rejuvenated peoples, like Japan.

But there will be terrible convulsions before a law for peoples is established that will be obeyed by the strong as well as by the weak.

The era of tribunals will not close the reign of violence. All they will do will be to make the bearing of arms a monopoly for the police. A public force, an army of the right, will be needed to enforce international law. It will be necessary to keep the powers of destruction and to preserve the art of war with the latest improvements, so that those who execute the law shall remain abreast of the progress secretly attained by evil-doers among nations.

Let us cast aside dangerous illusions; war will be seen again; preparation must be made for it. Consequently, there are grave reasons for trying to foresee what new forms it may take.

A very striking characteristic of this evolution is the generalization of the state of war. The coalitions of the past comprised a small number of belligerents. Now fire and blood is upon all Europe. This characteristic of political extension results from the fact that the present war arose, and probably all future wars will arise, from a conflict between two principles of general interest. The idea of arbitration tends to eliminate the lesser causes, more so still does the interlocking of material interests cross the frontiers. For war makes too many ruins to be unchained by caprice.

It is reasonable to think that young peoples, whether they be independent or bound by the colonial tie to older nations, will be forced into the future conflicts because their more diverse forms of activity and their more extended interests outside will not permit them to hold aloof from questions common to civilized humanity.

The condition of neutrality is becoming difficult to maintain. Holland may be said to exist only by the tolerance of the belligerents. The triumph of the empire of prey would mean an end of her independence. Certain neutrals avoid only half the evils of war. For this reason they will the more easily decide to run the risks of war in order to enjoy its profits at least.

Switzerland, Denmark, Sweden, and Norway do not escape these inconveniences altogether. But the most striking example of a neutrality difficult to maintain is that of the United States. It is not alone the liberty of their commerce that is put in jeopardy by German piracy, it is also the life of her subjects. As she is a great power, strong enough to treat Germany as her equal, proud enough to defend her prerogatives, the issue between her and Germany has been raised. The difficulty of remaining neutral appeared at once.

This difficulty does not result from a pure accident, but from the nature of things. It is inevitable that maritime commerce should gain in importance and that maritime blockade should become one of the principal means of overcoming the adversary. Submarines offer, for the attack of commerce, unequal facilities.

**EUROPEAN WAR—Continued**

No international treaty will succeed in stopping on this point a people determined to do anything in order to triumph. Whenever recourse is had to arms, it is because might is considered as the only law.

If the blockade by submarines is to be considered as inevitable, we must also consider its consequences. It involves the impossibility of conducting prizes to a safe place and perhaps that of boarding them.

Every day accidents affecting neutrals must be expected. The countries which allow themselves to be intimidated are ruined by the closing of the seas to their commerce. As for those who continue their commerce, if the current is not interrupted, the number of blockade-runners exposed to being sunk is multiplied. Belligerent ships carry almost always neutral merchandise and passengers. The definition of contraband of war is continually being extended to new objects. England has been obliged to include in it all German commerce carried by neutral vessels, even with apparent neutral destination; for instance, merchandise going to Denmark or Switzerland. The same problems will arise when the conquest of the air is complete. When aeroplanes carry passengers and merchandise we shall have aerial blockade. How distinguish between the rights of neutrals and belligerents in the rapidity of an action which admits no stop?

In the conditions imposed upon it by the technique of new arms and modern life, a war is then no longer a local accident, a restricted evil; it is becoming a general crisis of humanity.

**II**

Moral forces are becoming of increased importance. The victory is first gained in an immaterial theater, in public opinion. That is the cause of the efforts made by the belligerents to convince the universe of the justice of their causes.

There exist two kinds of arguments, and that invoked by certain officers of the Greek army or personages of his political entourage to convince the King of Greece, of course, considered less the righteousness of the German cause than German military power.

This incessant propaganda is a real offensive system, spread at great expense over the whole world. A great number of newspapers have been bought, others created, in Switzerland, Italy, Holland, Roumania, in both Americas, Denmark, Poland, Belgium, and even in invaded French territory.

It is not alone a question of persuading neutrals; it is for the purpose also and principally of shaking or sustaining the morale of the combatants. In the first place, it is important to create belief at home in the innocence and purity of their intentions, in the continuity and scope of their victories, in the certainty of their triumph. The necessity of convincing the soldiers is more evident still, as on it depends their morale.

Attempts are made to discourage the enemy's civilian population, so they shall demand

peace at any price. Insidious news is circulated by way of neutral territory. Advantage is taken of old private friendships, which serve as a pretext for correspondence, with request to pass the letter around. They organize petitions of mothers against the continuance of the carnage. Every means is used. The fact is that never has war been so much the work of the entire nation; never has so much been done with the soul.

And never has so much been demanded of the soul. Who claimed that the gentleness of civilization would soften human courage? Pessimistic words, contradicted by the facts. It is doubtful if at any time there has been seen such a harvest of heroism. Nothing authorizes us to believe that the future will be less fertile in heroism than the present. It is possible, on the contrary, that humanity will always surpass itself. The empire of the brain over the body is the fruit of civilization; without doubt it grows with the development of cerebral life.

Nerves of steel are needed. Even if one were deaf and blind, he would feel, through his whole being, the shock of bursting shells. One soldier writes that the hardest thing he had to do was not the actual fighting. It was remaining inactive under fire for 23 days and 24 nights.

This war has a particular character of individual self-effacement. The heroism of to-day arises from the conscience of the citizen, who is fighting for a profound sentiment of justice and who has a precise realization of international problems. The present struggle was at first almost anonymous, and no one thought of complaining of that. The individual disappears in *la Patrie*.

In the old days a chief arrived mounted, surrounded by a brilliant staff, on the battlefield in the morning and, before evening, the face of the world was changed. The generalissimo joined the aureole of physical courage to that of suddenly inspired tactical conceptions. Our generalissimo is the chief of a great enterprise. His instrument is the telephone. His battle lasts days, if not weeks.

There are sacrifices more difficult to make than the giving of one's life, the sacrifice, for instance, of our preferences and our passions. And our politicians have made a truce to all discussions. No trace remains of the anti-militarism that existed before the war. Everything has been subordinated to the public safety.

**III**

In 1870, France mobilized 800,000 men, Germany 1,500,000; to-day the figures are probably 4 millions with us and 9 millions with our enemies, or more than one-quarter the male population. In all, about 27 million Europeans have already been called to arms. The expression, "armed nation," has ceased to be exaggerated.

Furthermore, those who bear arms are only the most apparent part of the forces used in war. There is the railroad service and sanitary service, with a personnel half civil, and auxiliary establishments for the manufacture



of ammunition. So that there is, besides the mobilized, a whole people of workers devoted to a national task.

On account of not having foreseen to what enormous figures the expenditure of projectiles would mount, we had neglected to organize, in peace time, auxiliary means of making them. Even the arsenals of the state had figured too closely. So a great number of their workmen had to be recalled from the front. Henceforth, technicians skilled in all the different lines indispensable to the war—engineers, factory directors, foremen, skilled workmen, surgeons, wireless operators—will be more useful in the exercise of their specialties than they will be carrying a gun. Upon declaration of war such men, *whatever their ages*, should be mobilized in their professions. This was done with the railroad employes in this war.

Then there are a number of acts of commerce intimately connected with the war. It is by an intense current of importation that the state maintains its stocks of provisions and raw material. Most of its orders are placed with private firms. It is to the interest of the state to allow them to keep their employes. Men of the merchant marine have not been called to the colors. Every effort is made to keep up this resource. And it is a military resource to such an extent that we already see the German submarine making no distinction between warships and commercial vessels. And the destruction of mines and factories is very evidently an integral part of the new strategy, one of its objectives, in fact.

There is no longer anything strictly private. All sources of production are entering the national domain. Some day it will be necessary to assign each individual his task beforehand in all essential trades, just as in the mobilized army, and the country that has made the effort to co-ordinate the husbanding of her resources will have such a capacity of resistance that her rivals will be forced to imitate her, under penalty of mortal inferiority.

The same necessity carries, as a consequence, the requisitioning of machinery as well as raw material. At mobilization, besides wagons, horses, automobiles, aeroplanes, there will be pressed into service machines suitable for useful manufactures, as well as stores of wheat or flour, sugar, coal and metal. All that is more or less inaugurated in Germany, especially for staple articles for the sustenance of men and animals, and raw products of the soil, combustibles, lighting materials, etc. The state and an intermediary society created by it, called "Society of War Metals," seizes all stores of copper, nickel, aluminum, antimony, lead, and alloys, and retain charge of them till needed.

Similar societies have charge of forage, molasses, and all products of agriculture and industry used for feeding cattle. The products are delivered only to the communal association and to parties designated by the chancellor of the Empire; they make the local distributions according to need. All cereals which may be used for bread are forbidden as food

for cattle. A decree of the Federal Council, June 19, 1915, declares void all private contracts for purchase of wheat, rye, barley, sugar, etc.

The mixture of 30 per cent of rye in all wheat breads and of 10 per cent (later 20 per cent) of potato flour in all rye breads, has been made obligatory. The famous bread cards limit the consumption of bread to about 3½ pounds per person per week.

The production of sugar and that of beer has been limited. A census was made of cattle and hogs, and, after a part had been requisitioned to feed the army and the civilian population, it was decided to sacrifice about 30 per cent of the remainder to avoid feeding them.

The Allies have taken such measures to a lesser degree, because they have not had to contend with a blockade. While they have enjoyed the freedom of the seas, they have, nevertheless, found themselves embarrassed to procure certain staples and raw material. It is not to be doubted that the natural evolution of war will some day lead to the complete absorption of individual peaceful activities into the public action of national safety.

#### IV

The same conclusion may be extended to persons, *i. e.*, the liberty of the consumer. German housewives have been called on to revise their menus. It has been forbidden to eat sausage at breakfast. In France, retailers have been restricted to selling such and such a quantity of a certain foodstuff to any one person. Three dangerous tendencies had to be combated: wastage, cornering of products, immobilization.

In France, prescriptions as to individuals have hardly gone any further than passports. Precautions in this regard are made necessary by the spy system of the Germans.

In peace, concrete platforms for big guns were built within range of our citadels and quarries organized as defenses for the regiments of the Kaiser. At the time of mobilization, the attempts against our railroads did not succeed, but they might have caused grave delays. Numerous methods were used by German spies to communicate to enemy observers the movements of our troops or to rectify their artillery fire: lights, conventional signals of clothes hung out or windows closed, inscriptions on the inside of blinds suddenly opened, silhouettes formed by ox teams, etc. Advertisements of German goods bore marks for the guidance of the invading troops. When they arrived in any locality they were guided by some former employe of one of the principal business houses of the place.

Frenchmen who are mobilizable or who appear so have been requested not to go out without papers of identity. A similar regime could be easily applied to all persons; it has been proposed to have an individual civic identification card with photograph and thumbprint. With a personnel of verifiers, this all tends to the grouping of the population into a well-defined system.

Private life is again affected in the matter

**EUROPEAN WAR—Continued**

of correspondence. The censorship has systematically retarded and even suppressed letters. The combatants have been prevented from letting their families know where they are. Limitations have been made on the circulation of persons, especially in the war zone, but also at some important munition points.

Our legislators have just admitted a new right, that of every civilian, a victim of the war, to a compensation. The cases of individual loss are investigated, with a view to an equitable settlement, and the refugee is provided shelter and even work. Indeed, the inhabitants of the theater of war are profoundly affected. All their goods are requisitioned, their houses are dismantled for the improvement of trenches, and their own labor is required for the digging of rest trenches, removing the dead, etc.

In invaded regions, the civilian is thrown perforce into the war and incorporated into a sort of semi-military régime. We see the Germans treating everybody more or less as a franc-tireur. The civilian population in rear of the German lines is literally in a state of slavery. Men are obliged to take service in the German army. It would have been better for their protection if they had been organized in such a way that the enemy would have had to take some recognition of their status. It would not be impracticable to carry non-combatants on rolls and subject them to a discipline more precise than the simple police authority that rules them now. This is in a line with the mobilization of civilians in their trades.

Every sort of office that does not involve actual killing should be turned over to men unfit for active service; old men, boys, and even women, on the British front, suffragettes have replaced to a certain extent signalers, telephone operators, telegraphists, carriers, letter carriers, automobilists, stretcher-bearers.

One cannot dream of wars in the distant future without visualizing our descendants in a sacrifice more complete than war. Like a mass suddenly solidified, the entire people will be only one block in front of the enemy block.

## V

Those who predicted that the war would be short underestimated the resources of a great country.

The real reason for the long duration of the war is the power of the defensive. Short wars are those in which the front, like a delicate scale, is sensible to the least inequality of the forces. In the eternal struggle between protection and the projectile, equilibrium seems to be always re-established between them. Nothing allows us to foresee whether one or the other will have a permanent advantage. If it should be protection, wars would be interminable; if the projectile, wars would be soon over.

Nothing authorizes us to suppose that future wars will be shorter than this one. Superficial differences will be adjusted without

bloodshed. A conflict of important interests will bring on gigantic struggles.

A new characteristic, which contrasts with the mediocre efficiency of the offensive and the long duration of hostilities, is the extreme mobility of the operations. Mechanical means of transport permit the mobilization and concentration, in a few days or weeks at the most, of considerable means in an entirely new theater.

Each time that a new means of killing appears, good souls expect to see war made impossible by its excess of destruction; and often technicians announce the speedy abandonment of ancient arms. But rifles are added to sabers and lances, bombs to cannon balls, machine guns to bayonets, aviators to armored trains, submarines to warships, without man renouncing the instruments of death that science puts successively into his hands. It is a miracle that bows and arrows have gone out of use. Slings, catapults and Greek fire have just been reborn in forms still more dreadful. We have no fewer than 5 developments of cavalry, cyclist troops, those manning war autos, captive balloons, dirigibles, and reconnaissance aeroplanes. There are from 12 to 15 calibers of artillery in each army. There are about 60 varieties of specialties, a real little dictionary in itself.

Napoleon was ahead of his time in the numbers of men that he assembled. It is said that in 1812 he had got together more than a million. But he did not operate with more than 650,000. The machine was too heavy for the material conditions of his time. But there has been a century of progress, and now groups of armies are articulated without difficulty, thanks to improved means of communication. However, we did not expect to have to bear the shock of more than 21 active army corps, increased by 3 or 4 reserve corps, whereas, beginning with the middle of August, 1914, the Germans operated against us with 33 corps and 9 cavalry divisions. Later, they had more than 50. On the Russian front, there were 45 German corps in June, 1915, and 26 Austrian corps. In all, 2¼ millions was the strength of each of the two peoples confronting each other on the western front, about 3 millions on each side on the eastern part. These enormous aggregations were decomposed in armies of about 200,000 or 250,000 men. The famous phalanx of von Mackensen was composed of 10 army corps, disposed symmetrically, 2 corps in the first line, then the artillery massed in 3 lines; then 6 army corps in 3 lines, covered by flank-guards; finally, a reserve of 2 corps. In all, about 400,000 men for a front of 20 kilometers—20 men per running meter.

We are only at the dawn of mass movements. In the future, allied combinations, moving convergently on a country like Germany, could be immense.

In the question of matériel, the figures are already large. Our offensive in May around Notre Dame de Lorette was prepared, it is said, by 1100 cannon. Against the Russians, the Germans probably had 4000 on a front of

50 kilometers. Germany manufactures 250,000 shells a day. They count on expending 35,000 a day; the French 13,000.

The question of time will enter greatly into future attacks. In fact, the terrain seems to be the only thing that cannot be expanded. Since the front will be limited, resort will be had to successive waves of attack, accurately timed.

In this war, sufficient men were available to occupy a whole frontier. Perhaps in the future, frontiers will be equipped with a continuous line of defenses. It is probable that the frontier will form only the surface of a disposition in depth, abundantly provided with defensive and offensive centers.

The value of an army remains what it always was—the product of two factors equally indispensable, man and material, or, if you like, soul and mechanism.

Without a soul equal to ours, the most perfect armament arrives at nothing but scientific barbarity, and, let us hope, final powerlessness of our enemies; without arms equal to theirs, our chivalrous heroism would never give us anything but a precarious and sterile superiority.

[Tactical Notes. *The Military Historian and Economist*, Jan, '16. 4000 words.]

*Frontage and Depth.*—(By C.) The current literature of the war has led to the idea that there has been a revolution in the art of handling troops on the field of battle, due to new high-power large-caliber guns, aircraft, wireless, and other modern inventions. A close study, however, shows this view to be incorrect.

In order to be secure on the defensive, it may be asked: "Why not use 6 men per yard if you are in doubt about 4 being sufficient?" Assuming a battle line 400 miles long, the difference between 4 men per yard and 6 men per yard is, in round numbers, a total of 1,408,000 men; and, for an army on a voluntary basis, this means a difference in cost of 7 million dollars a day. Hence it is evident that a close study of the military situation must be made to prevent waste of men and money. In other words, it remains a problem for professional military men. The quality of the troops becomes a most important factor. Deficiency in training causes the necessary number of troops to mount rapidly for the defensive; and on the offensive, such troops are almost useless against trained troops employed at any density. Only an approximation is possible in theory. Good troops on the defensive may be used 5 men to the yard in the open, and under cover the number may be reduced to 2.2; while for poor troops the number in either case may be 9 or more. On the offensive, fifteen men per yard won some of the great battles of history, and there is no present indication that this number can be reduced. Recent, as well as past history, shows positively that there is no such thing as an impregnable line or impregnable fortress. It is merely a matter of having the means of capture and being willing to pay the price. An attack, to pay well, must be carried simul-

taneously along a front of fifty miles or more, having at disposal for that front at least 1,320,000 men and being prepared to suffer a loss of one-half if necessary. Such a proposition is staggering indeed. Here the skill of leadership comes into play in determining the front to be attacked, the depth of the attacking formations, the probable losses and resulting advantages. The principal lesson of recent military history is the value of trained officers to direct and instruct troops and to co-ordinate the employment of all the engines and devices of war. There is no heligierent country to-day that does not bewail the necessity of having to send to the front so large a proportion of its trained experts at the outbreak of hostilities. These officers cannot be replaced. A trained officer, in the European sense, is one who has made the military profession a life study; and to multiply soldiery and economize on trained officers is like hiring ten men who do not know how to build a bridge over the Hudson, and fancying this method cheaper than paying one expert his price.

*The number of men per yard front in battle.*  
—(By W. H.)

Assuming a well entrenched line which it is intended to attack: on the front line each man of the attacking force must occupy a yard—less distance per man prevents proper use of weapons. Starting with one line of this density, casualties by death and wounds and by men losing their nerve and seeking shelter will reduce this strength until but little is left on reaching the enemy's line. Hence fresh men, to push the line forward, to meet counter attacks, or to extend to a flank, must be sent in. In places this strength must be piled up to as much as 20 men per yard, but in other places less density will suffice. Herein lies the difficulty of the problem of deployment. Men must be available where needed, but placing too many in one place not only robs other parts of the line of necessary strength, but interferes with proper handling of the line at that point. The same principles apply to the defense. Fewer men on the average are needed than on the offensive, yet the same proportions holds true. Nor do the difficulties of the commander cease with an accurate estimate of the mere physical possibilities of the situation. He must gauge the quality of his troops as compared to that of the enemy.

*The influence of the heavy mobile gun on military operations in the European War.*—(By A. N.)

Due to the extreme difficulty of obtaining information, speculation on this point is somewhat futile. However, the utility of the large caliber German guns, especially in the initial operations, is beyond question. Since the opening of the war the Entente Powers have devoted their attention to the development of large numbers of heavy mobile guns. Though less has been heard of the smaller calibers, such information as we possess indicates that their use has materially aided all operations. Mechanical traction and the use of the network of railways have been potent factors in

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the employment of the heavy pieces. High-explosive shell has added great value to heavy ordnance. A third factor has been the development of the long recoil carriage, permitting firing from a simple platform or even from a traveling carriage, whereas the former models required the preparation of emplacements, which took labor and time. The result is that the heaviest calibers have become almost as mobile and easy to get into action as the light, horse-drawn gun. The effects of the introduction of heavy field artillery have been varied and must be considered from the point of view of the influence on present and future fortifications. Certain it is that, in the future, construction will not place "all the eggs in one basket"; and strong infantry trenches, in successive lines, protected by obstacles, will be largely depended upon. The artillery of such positions will be scattered over the terrain, relying on concealment for protection, and on their dispersion to minimize the effect of hostile fire. In the field battle, it appears that the heavier pieces have not been so much used as against fortifications, the opinion being, apparently, that the intense local effect of the shells does not warrant their use against thin lines on open ground. Calibers from fifteen to twenty-one centimeters have here played an important part.

Reports at hand from observers of the German initial advance through Belgium and northern France indicate that the German field artillery was inferior to the French, but that this preponderance was practically offset by the German heavy calibers, especially the fifteen cm. howitzer. The shells from this gun, through both their physical and moral effects, frequently were able to prepare the way for an advance when the lighter field pieces had little effect. The use of these guns, however, apparently changed no principle of tactics, their influence being merely that of varying to a greater or less extent the nature of the local combats.

After the battle of the Marne the character of the struggle changed, and a new problem of trench warfare arose. The light field gun is almost totally ineffective against intrenchments, and can only be relied on to keep the enemy under cover from its shrapnel. Large numbers of heavy guns were massed for the purpose of "shooting the enemy out of his trenches." Eye-witnesses of the action at Neuve Chapelle say that the effect of concentrating three hundred and fifty heavy guns on a front of about seven thousand yards was to obliterate the enemy's trenches completely. However, the opportunity was lost by failure to support the infantry attack which followed. At Przemyśl it is reported that, following a severe bombardment, one German battalion reached the Russian trenches with a loss of only two men.

From present information, however, it would appear that no vital change in tactics has taken place, and that the principal result has been a modification of the views formerly held as to the value of permanent fortifications.

[New Tactics for Old. *Army and Navy Gazette*, Jan 29, '16. 600 words.]

Many English attacks in France and Flanders have failed because they were made on very narrow fronts, which allowed the Germans to move up and concentrate on the points of danger. Also, there has been a lack of co-ordination between the English attacks in the west and those of the Russians in the east. It has been noted that the capture of the German first line trenches is not usually accompanied by heavy losses—the heaviest casualties usually occurring during the rush forward from these first trenches.

In order to obtain success without enormous losses, it is urged that the English attacks coincide with those of the Russians, that they be made on a front of 40 to 50 miles instead of 12 to 15 and that during such attacks the entire German front should be kept engaged. Once in the German first line trenches these should be held until the guns can be brought up and located so as to protect a further advance.

When reserves are needed either to hold a position recently captured or to make a counter-attack, they should be taken from the older and more experienced troops rather than from those recently arrived. New troops can be depended upon to carry out an attack under the protection of artillery fire, but when their first impetus is spent they require the assistance of troops more accustomed to war conditions.

[The New War. II. The Materials of War. By Georges Blanchon. *Revue des Deux Mondes*, Jan 15, '16. 15000 words]

It is to-day plain, future wars will differ radically from those known to history. Just as the social physiognomy of war has undergone a change, so will its material.

The first thing to notice is the influence of means of transport. And first the railway: Military trains follow one the other at regular intervals. A single track may permit the passage in each direction of 20; a double track of 50, 60, 100, or even more. We [the French] on certain days and lines went up to 220. A double-track line may be counted on to handle an army corps per day. Other elements, however, must be taken into account, such as branch lines, for example the German strategic railways in Alsace-Lorraine. The total German system runs up to 60,000 kilometers, the French to 37,000. The six great French companies together operate 15,000 locomotives, 30,000 passenger cars, 400,000 freight cars.

The first duty of the railway lines was to furnish the transport called for by mobilization and concentration. We [the French] utilize 4750 trains in this work. But the service of communication, and changes of position also call for trains. The first is tolerably regular; the second wholly irregular; but as it may be of the first importance, sufficient rolling stock is constantly held in readiness. The armies are constantly migrating. Still ours have been more stationary than those of Field Marshal von Hinden-

burg, for example. Napoleon said: "The force of an army is like the quantity of motion in mechanics, the product of mass and velocity." Now the railroad is a means of giving great masses great velocity. It can make 600 kilometers in a day; on foot, one is limited to 30.

It may be expected that the mobility of armies will increase in the future more than their effective strength. The countries which organize for war will not fail to establish on their frontiers complete systems, capable of transporting all the general reserves in a single trip.

The advantage to the country acting on interior lines is somewhat offset by the longer duration of battles in these days.

Whatever importance the automobile and aircraft may take in military transport, it is probable that the railroad will always be preferred for moving certain heavy material. The car itself may be adapted to military uses. We have water-cars, refrigerator-cars, sanitary trains, and also armored trains and flat-cars used for gun-platforms. The drawback to the use of armored trains is that of everything which is tied to a track: limited sphere of activity and numerous risks of immobilization.

The gun-car, in use, transmits the shock of firing to the ground by means of supports that take the place of the wheels for the time being. The great siege-guns are generally fired from masonry platforms, but the railroad is usually used to transport them to their positions. By distributing the weight over a sufficient number of axles, cannon weighing 100 tons may be transported, that is to say of a caliber of 38 to 45 centimeters. The German 42-centimeter howitzer seems to have been calculated on this basis.

Both sides have supplied the absence of regular railroads by laying rails on the roads. Trained sappers can lay about one kilometer in three hours' work.

The means of transportation par excellence is, however, the automobile. While the least accident blocks the railroad, the automobile can only be stopped by the destruction of the road, which is rare, or a breakdown in its own motor. Private machines, from the sumptuous limousine to the motorcycle, have been reserved for staff-officers, couriers, etc. Troops and material are transported by autobus, touring-cars and trucks. Each large machine will carry thirty infantrymen. A convoy of 1000 or 1200 carries an army corps. The speed of the convoys may attain 12 or 15 kilometers an hour. An army corps would stretch along about 20 kilometers. On foot, an army corps occupies 32 kilometers and it takes 8 or 9 hours for the tail to arrive at the position of the head.

France has an excellent system of roads, which lend themselves well to transportation by auto. One of the problems of the future may be the moving off the roads. Whether leading elements of future convoys will be furnished with platforms for the crossing of ditches, etc., is only a conjecture, but it would

not seem to exceed the means of modern science. A system of trails across the fields, constructed in time of peace, might well increase ten-fold, and perhaps a hundred-fold, the numbers of autos on a given front. An army will maneuver freely over a province almost like a battalion on a maneuver-field.

It has been estimated that our automobile parks, in the zone of the armies, transport regularly each month 160,000 to 180,000 tons of material and about 300,000 men. Von Kluck's army, in the enveloping march at high speed towards Paris, like fractions of von Hindenburg's armies in Poland, used the following method: a third of the infantry, 75,000 men, it is said (in Von Kluck's army), rode in automobiles, while two-thirds marched on foot, and riding in their turn. The automobile was used for rest. They were able to advance, by these means, 50 kilometers a day. Five thousand autos were used. It is said that the German staff had united, on the one front, more than 20,000 autos for this service.

At the beginning of hostilities the belligerent powers had at their disposal 250,000 automobiles for heavy loads; 90,000 in France, 70,000 in Germany, 55,000 in England, 25,000 in Austria-Hungary, and 10,000 in Russia. Thanks to the measures taken by us to encourage the construction of trucks and tractors, we thus found ourselves in the lead. The best vehicles had a net capacity of 2 or 3 tons at a speed of 15 km. per hour. Our 1500 Parisian autobuses were of incalculable service. The second day of the mobilization, 500 of them were rushed towards the Belgian frontier. Berlin could mobilize only 1000 in all. The first British expeditionary force embarked with 700 autobuses.

The automobile, like the railroad car, has special installations. There are auto-ambulances, auto-kitchens, auto-searchlights, telegraph-autos, auto-caissons, auto-cannon, machine-gun autos, automobile aviation parks, etc. For instance, during the winter, the arrival was announced of 250 armored cars, carrying machine-guns for the English army. These are light models. The Russians make some which do not weigh more than 2 tons, while those with which the Germans opposed them weighed as much as 10 tons and bogged down in the bad roads of Poland. But the weight should be in relation to the width of the wheels.

It seems that the future will favor the light types; weight detracts from speed, one is tied to the good roads; one cannot think of using armor to resist shells. We must rather expect to see an increase in the number of machines. That will be the true form of the cavalry, or rather the intimate union of the three arms. A swarm of cannon and machine-guns driven across the plains, manned by soldiers, might charge trenches even and, if it pierces the enemy's front, spread over the country behind. It would operate in great masses, and its effect would be stupendous.

We recall the diffusion of German autocannon in isolated units, pushing along the

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roads at random, or armored cars, carrying one or two machine-guns, and fulfilling the rôle of patrols. Manned by 8 or 10 men, they advanced, under the cover of night, far inside our line, terrorizing the countryside and carrying off sentinels. Thus spreading out in all directions, in communication, no doubt, with headquarters by wireless telephony, exploring autos will cover a whole region in a few hours. They will complete, by direct contact, the information gained by aviators.

**II**

Aviators have played, in the present war, a rôle as notable as that of automobiles. But the future evidently holds for them a greater still. The aeroplane will probably always be incapable of transporting heavy material. It will hardly be possible to transport more than the troops themselves. If it were to serve to move an army, some other means must carry matériel to the point of arrival.

We have yet progressed no further than the scouting aeroplane. The largest usual models carry only two observers besides the pilot. However, our Russian allies have already made the trial of a giant aeroplane, invented by Sikorski and furnished with a cabin for 5 or 6 men. There is no doubt that the future will produce aeroplanes that can be used for transport, even in civil life.

There are two great obstacles that will disappear very soon, no doubt. For carrying passengers, machines of large dimensions are necessary, and they must be entirely safe. The fatigue of driving is great when it is done by the sole effort of the arms and legs. Some gear for multiplying the drivers' own strength is necessary, but such contrivances fail to function at times.

It is thus that the question of dimension is related to that of security. This latter question has occupied the attention of many inventors. Their solutions belong to two classes. That of the unfortunate aviator, Moreau, was to trust an automatic mechanism to bring the machine back to a safe position as soon as it assumed a dangerous one; but then this same mechanism, if it fails to function, will necessarily imperil the machine. The other method, of which M. Doutre is an exponent, consists in providing the pilot with an automatic aid, which, at need, will right the machine, but which never opposes the personal moves of the aviator. Pilots prefer rightly this second type of security to the first; for there is no mechanism that will not fail at times. The two systems will be combined in the final solution. The addition of a practical parachute would seem necessary. Experiments made indicate the hope of success in the near future.

We can hardly compare yet with automobiles the possible number of passengers of the future areobusses, but we can consider the relative speed. Instead of 15 kilometers an hour on the road, we shall have 100 or 200 above the clouds. The expense could not fail

to be greater, except that the aeroplane has no equivalent for the wear on the wheels. When it is a question of a new military expedient, we must never assume it unlikely that the enemy will make the necessary sacrifices. We did not believe before this war in the strength of the material effort made by the Germans to prepare for it; it has cost us dearer than an effort equal to theirs would have cost.

Aerial transport would change completely the physiognomy of combat and the means of strategy. It would be equivalent to the almost instantaneous change of position of troops. It makes one wonder what would be the fate of lines of communication thus menaced by an enemy's descent.

The aeroplane is already capable of combat. One of our small machines can already sow one or two thousand "fléchettes." The most common bombs are artillery shells of 90 or 155 mm. An aeroplane carries a dozen bombs. The great drawback is inability to stop to rectify his fire and to direct bombs out of the vertical. Perhaps, by use of a horizontal screw, they will eventually be able to stop; Col. Renard has demonstrated that it is impossible with the weight per horse power of our present motors. But it would seem that a system of vertical planes could be devised to enable one to descend slowly straight down.

Another improvement would consist in launching bombs by means of a little mortar or a sort of catapult.

The supply of fuel is to-day amply sufficient to last as long as the endurance of the driver. Our aviators have proved it by going 150 kilometers from their base to bombard Carlsruhe. They had to remain in the air 6 hours, and this is about the limit of what may be expected of a well-trained man. It is hardly possible now for the observer to change positions with the pilot en route.

The offensive action of aeroplanes against land targets is not yet very formidable. It is as scouts that they have done the best service. They observe enemy concentrations, locate trenches, ascertain the condition of fortifications, and help to regulate the fire of batteries by observing the fall of shells.

Since the aeroplane cannot now remain in the air without moving, and it would be useful at times if it could, this facility might be afforded by captive balloons.

If our aviators of the intrenched camp of Paris had been able to rush to the pursuit of the "taube," not from the surface of the ground but from 1000 meters above, they would have gained 7 or 8 minutes or say 12 kilometers.

Aeroplanes are exposed to the shots of the adversary whose secrets it surprises. A rifle bullet mounts to about 1800 metres, the shell of our 75 to 4000. Very few aeroplanes are put hors de combat and our man-birds make light of fire. Their principal enemy is the hostile aviator.

It would be a great progress if the noise of the motor and propeller could be diminished. Another consists in diminishing the

visibility of the machine by making the planes of some transparent substance. It is said that the Germans use "cellon," a sort of non-inflammable celluloid invented by two Frenchmen a little before the war.

Future air strategy will be only a development of naval strategy, but with what curious variations! Before operations against land targets can be instituted, it will be necessary to gain the mastery of the air. That question will be settled in the high atmosphere, out of range of most terrestrial cannon. Aeroplanes will maneuver, then, to get the advantage of altitude.

There will probably be three kinds of fighting aeroplanes: the *height specialists*, light, rapid machines, since it takes speed to stay up in a more rarified air; the *shock specialists*, armed with a ram; *gun aeroplanes*, weighed down by their artillery. The first two types will be combined perhaps, having the common quality of speed. The monoplane seems to be the most likely type.

Three elements of maritime war are without equivalent here: armor, which necessitates weights incompatible with flight; the invisibility of the submarine, another form of protection; finally, heavy artillery of long range. In the air they will fight at close quarters, except, on occasion, in the vertical direction. Encounters will be rapid and terrible. The vanquished precipitated from four or five thousand meters, will be reduced on the ground to pulp and smoke—unless ingenious parachutes transform their fall into a pleasant ride.

The squadrons of the air will advance in cubic order, will come together in furious charges, will cause a rain of bloody debris to fall on the ground. And the victorious fleet, soon followed, at a few hundred meters from the ground, by the heavy convoy of bomb carriers and transports, will swoop down like an immense flock of birds of prey, on the territory of the vanquished, casting everywhere gloom, death and fire.

### III

The present war has shown the immense assistance given by naval forces to land operations. Their influence made possible the transportation of the English armies to the continent, that of our colonials across the Mediterranean, the Allied attack on the Dardanelles, the German expedition to Courland, etc. The cannon of our North Sea fleet denied the Germans possession of the dunes of the Belgian coast near Nieuport. Then there was the most important of the colonial expeditions, that of the Japanese to Kiaochau.

The fleets of the future will have the means of throwing millions of men on a distant coast. They will have provided landing material which we lack now. At the Dardanelles, a first trial was made with a large steamer, the *River Clyde* which had been gutted, in such a way as to leave the hull a sort of long tunnel. Forced at high speed onto the beach at Cape Helles, it grounded so that its front part almost reached the shore. Large doors

at each end, prepared in advance, were then opened. Lighters carrying troops came up to it as to a pier. Men, wagons and cannon went through it without difficulty and out on the beach by means of an inclined plane. (But see INT. MIL. DIGEST, Annual, 1915, p. 96, column 1.—Ed.)

In the future, the ship of the line will be meant for naval combat alone, and there will be floating batteries to act against the forts. The type will probably be of slight draught, heavily armored and carrying one gun of the largest caliber that a boat can receive. The weight being distributed uniformly in the liquid mass, these cannon will be the most monstrous masterpieces of homicidal machinery. They will not be inferior to the coast batteries, either in range or weight of projectiles.

One of the greatest drawbacks to the attack of coast defenses is that the splash of the projectile permits the land gunner to rectify his fire. This will probably be overcome in the future by curtains of smoke. In this war, smoke has been used to hide Zeppelins and boats from the enemy's fire. The squadrons of the future will approach the coast dissimulated by a screen of smoke and using aeroplanes to observe their fire, will employ some development of the indirect methods used by field artillery.

Battleships are now very vulnerable to mines and torpedoes and some method will have to be devised to make the torpedo explode at a distance of 2 or 3 meters, at least, from the hull itself. Instead of a movable Bullivant net, which cannot remain in place when the ship is under way, the battleship might carry a sort of second metal hull, separated from the real one by a layer of water. This system would mean an increase of weight and resistance, bringing a decrease of speed. But this would be offset by the security afforded.

Thus equipped, it must be believed that the battleship will survive. It is bound to, from its very "raison d'être." It represents force. It plays on the sea the rôle of the policeman on a public square. It commands the sea and the shore; that is to say it closes them to transports of the enemy or opens them for its own, and the same with commerce. The unit which dominates the other naval units will have the last word. The mastery of the sea remains the preliminary condition of every maritime enterprise.

The most formidable enemy of the ship of the line will undoubtedly be the aeroplane, dropping bombs on its gun-turrets and armored decks (for the decks of the future will be protected from above). Here again, smoke curtains might be useful.

As for the submarine, nothing authorizes us to believe that it will supplant its adversary of the surface. Many have thought so. But the principle of the submarine is essentially defensive. Everything in it is subordinated to protection by the water. And if it possesses offensive value, it is because that protection hides it from sight as well as

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shots and gives it thus, as an accessory, an active element, surprise. The battleship, on the contrary, is the very incarnation of the offensive principle.

The submarine is to-day technically in advance of the battleship, as well as of the air fighters; hence its momentary success. If, instead of 30 or 40 submarines, the Germans had possessed ten times that number, the sea would have been closed to us. But the submarine will always have two insurmountable defects: its weakness and its nearsightedness.

The universal progress of machinery will only increase the importance of sea power. We are at a period when the capacity of available transports does not yet correspond to the effective mobilizable strength. But the latter is close to its maximum limit. A people will be able, some day, to throw all its army on a distant coast in one expedition. Maritime war will always have its principal interest as an auxiliary to land war. The supremacy of the action on land cannot be doubted; by it only is an enemy nation reached in its soil and its flesh. But why set the two forms of military power against each other? They are destined to support each other.

Seaways are not the only ones open to boats. German submarines circulate by the Belgian canals. On the Yser our gunboats played their part in the concert of death. Canals are of great advantage for the transport of war material. As yet, however, there is no special type of fighting ship for use in canals.

Canals afford great advantages over railroads in the evacuation of the wounded, thus spared the jolting of trains.

For the various means of transport now used, the operating personnel may be taken to be 5 or 6 per cent of the combatants.

**IV**

Machinery would have changed the aspect of war if it had been applicable only to means of transport. But some of the armies themselves are the most marvelous machines conceived by man. Our 75 is the perfect solution of a certain number of mechanical problems. The cannon is the great master of the present battle. It makes the progress of troops possible over open ground. Our light field-piece can fire about 30 shots a minute. The number of the guns allows the whole front to be covered.

Our armies use pieces of 20 different calibers. Here are some of the ranges:

German, 77 mm.—	5.5 km.
French, 75 mm.—	6.5 km.
German, 105 mm.—	10.5 km.
French, 105 mm.—	12.5 km.
210 mm. howitzer—	8 or 9 km.
420 mm. howitzer (German)—	14 km.
305 mm. gun—	25 km.

We have some 340 mm. guns whose range is still greater than the 305. The English fleet uses 381 mm. guns. There exists a German seacoast gun of 406 mm., weighing 113 tons. This must approach the limit of weights

usable on land. But progress in the quality of metal and in the technique of powders will certainly extend the ranges still more. It is then not exaggerated to count on destroying an enemy at 50 km. or more.

The German 406 projectile weighs 940 kg. The explosion of such engines, which will produce veritable little artificial volcanoes, will pulverize concrete parapets and the armored turrets of forts.

The invention has been announced of aerial torpedoes, a sort of small dirigible loaded with explosives and driven by a compressed-air motor. These can be controlled by the firer by means of Hertzian waves. But they have the disadvantage of having to move slowly so as to be seen by the firer. They can also be seen by those fired at, who will succeed in destroying them or spoiling their direction.

Cannon of decreased caliber are used in the trenches for hurling bombs to a distance of 300 or 400 meters.

There has been a great increase in the numbers of guns. Along the western front, there are at least 15,000 pieces for an effective force of 5,000,000 combatants, or one gun for a few more than 300 armed men. The proportion may increase, but the principal mass of the army will always be composed of infantry with small-arms.

Perhaps, finally, half of the men in the trenches will be operators of machine-guns and bomb-throwing machines. The machine-gun fires only rifle-bullets, but at the rate of 900 per minute at need. A machine-gun is equivalent to 80 rifles. We went to war with a two-gun machine-gun section to a battalion, the Germans with four times as many. We are increasing this kind of armament. The machine-gun has the range of the rifle, from 2400 to 4000 meters, according to the model. In practice, ammunition is not wasted in firing at long distances, and it is at less than a kilometer, and more often almost point-blank, that the terrible bullet-pump is used.

Like the bomb-throwers, the machine-gun has to be transportable by hand. It weighs about 20 kg. and it takes 2 men to move it. They are used in the angles of the trenches and in improvised forts; they cross-fire behind the lines, in such a way as to stop short any enemy offensive that has succeeded in clearing the first obstacles. It seems that their number will still increase considerably. A total of five times in excess of that known to-day will be attained. That will mean more ammunition supply. However, it must be noted that the growing number does not necessarily bring a proportionate expenditure of ammunition. Often its principal effect is to permit a concentration at a decisive moment: there is expended in a few minutes what was spent in a few hours formerly. Sometimes less is expended; it is used simultaneously, instead of successively. The result, more overwhelming, is more complete, not more costly. The pieces are quiet longer; they bide their time and strike only at the right moment. But greater supplies are necessary.



A more handy instrument than the machine-gun has been made, half-way between it and the rifle, an automatic rifle. It is the offensive form of the machine-gun. Weighing 7 or 8 kg. or only twice the ordinary rifle, fired from a rest or from the shoulder, carried by the firer to the enemy's trenches, the automatic rifle seems to be the rifle of the future. It will be capable of sweeping the terrain with 500 bullets a minute. The difficulty being to carry cartridges and to feed the machine, there will probably be only one gun to two or three men.

The rifle of the future will, perhaps, not be used beyond 1200 meters, on account of the number of light cannon. So the caliber might be reduced to 4 or 5 mm. (the Lebel now is 7 mm.), if a heavier metal is obtained for the bullet and greater initial velocity. These small pellets would produce only very small wounds, harmless unless they touch a vital spot, but sufficient to put a man out of action.

The lines are closer and closer. Two weapons take us nearly back to the Middle Ages; the hand-grenade and the subterranean mine. It is curious to see the last word said by a projectile launched by hand like a stone, the weapon of the first men. The grenade is a ball charged with melinite, attached to the wrist by a bracelet which tears out the igniter of the primer when the grenade leaves the hand. It is thrown 15 or 20 meters; but it can also be adapted to an arrow pushed by a special cartridge in the infantry rifle—it then carries 400 meters. These grenades are made in factories of the interior. The equivalent of them is made at the front. They are packages of powder, set off by slow fuses, ignited at the moment of throwing. They are fixed on small boards shaped like racquets.

Sapping is quite as archaic. Its new importance comes from the present impregnability of the defensive fronts and the force of our explosives. The defense against the mine is the counter-mine. To find out where the enemy's sappers are digging, one listens. Microphonic apparatus will, doubtless, enable the listener of the future to hear better and will eliminate almost entirely the element of surprise that characterizes this kind of warfare. There, again, individual genius will have to give way to regulated effort and collective preparation. Success will depend on questions of mass and mechanism.

One of the first uses of machinery will be to dig the galleries. Working by hand, the advance is limited to about 2 meters a day. There are machines that remove earth 3 or 4 times as fast when they are adapted to the task. The drawback is that they make a noise. As it is most often a question of establishing mines before the adversary speed is an element of first importance. Subterranean war is in its infancy.

It already necessitates enormous expense. A mine may be either offensive or defensive. Offensive, it must blow out the earth clear to the surface, destroying the troops and their shelters; defensive, it ruins an enemy mine, either by making it explode prematurely, by

obstructing the gallery in rear of the mine-chamber or by loosening up the soil in front of the work, which renders it nearly impossible to continue. This last type is called a "camouflet." It needs only moderate charges. But the offensive mine-chamber requires sometimes 150 kg. of melinite. A war like ours consumes monthly hundreds of tons of subterranean explosives. We must foresee a very great development of this kind of operations when it is a question of forcing trenches solidly organized and defended by an artillery which cannot be silenced and when the mastery of the air cannot be gained.

And, perhaps, lacking sufficient explosives, the future will see galleries constructed rapidly enough and multiplied to such an extent that they will serve as a means of approach to direct attacks with the "arme blanche." That has not ceased to be the "ultima ratio" of combat. The bayonet has played a most important rôle. It has decided the fate of many desperate actions. It is too long, however, for that narrow field of carnage, the trench. Some preference is shown already for a long knife attached to the belt. If the machine-gun rifle dethrones our bayonet-carrying gun, who knows if a light lance, carried on the backs, will not make a definite separation of the two death tools. Then a shield only would be needed to reconstruct the fighting-man of the Iliad.

v.

Let us pass over liquid fire and asphyxiating gases. The first procedure has not the efficacy of aerial bombs; the second presupposes a favorable wind. Any product, which may prove dangerous for those who use it has a limited future.

The defensive develops at the same time as the offensive; it replies to its progress by equal progress. Thus the equilibrium is, in a way, the effect of a fatal law.

But this equilibrium is not stationary. It leans sometimes to one side, sometimes to the other. Now, to-day, the defensive seems to have the advantage. Look at the trenches: they bar the whole front with an impassable obstacle. Never have armies been paralyzed in their entirety, as those of the western front have been for more than a year. And some are going to cry: "Protection triumphs in a final manner over attack." There will be some to add that war will become impossible on this account. Others will wonder why no one realized a long time ago this marvelous power of the trenches, which people were in a position to construct formerly as well as now. If they resist successfully present weapons, what would they have been against the old rifles and impotent cannon? And would they not have made invincible the army inspired enough to have taken shelter in them, 40 or 50 years ago?

Everyone knows how trenches are made. Is it simply from a failure to think that fighting in the open was preferred? We shall not decide that question; it is the affair of higher authorities. Perhaps the insufficiency of the

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effective strength, preventing the barring of the whole frontier line, made the trench inefficacious. For the fortified front ran the risk of being turned by the flanks. In any case, it is a mistaken notion to attribute the present phenomenon to the preponderance of inert protection.

It coincides, on the contrary, with a failure of protection. The fortifications, where the most formidable defenses had been accumulated, scarcely held a few days, when they trusted to their concrete ramparts and steel turrets. The modern shell, with a great capacity for explosive material, crushes everything. No permanent work is capable of withstanding its fire.

However, the enemy's rush broke against Verdun. It has never been able to pierce our improvised lines from Belfort to Nieuport. The intrenchment resists and almost as well, when it consists of a simple reveted furrow, but deep, as in its most pretentious bastions. Its virtue is not, then, so much in the shield that it forms as in the power of the weapons which it contains.

It is in the two together. Why cannot the interval between the lines be crossed? It could formerly. The new element is the impossibility of progressing over open terrain under fire. The rapid-fire rifle and the machine gun have made trenches impregnable. This invulnerability results from the new power and the old weakness of the bullet, which allows no circulation outside the trench, but which did not hit and never will hit anyone inside.

Trench war is then a war of bullets. We perceive already what is going to put an end to it: the war of shells. Whether it is launched by cannon or from aeroplane, the shell kills in the trenches as out of them, but not so well. Its effects are limited by traverses. Undoubtedly, shells having a burst straight down will be devised. A rain of "fléchettes" along the front would be still more effective.

Already artillery makes simple trenches sometimes untenable; it prevents the assembly in rear which would allow assaults. If the artillery were protected from shells by its epaulements and defiladed as the infantryman is from bullets by a bank, the situation would have no other solution than a war of mines, which is slow.

But artillery destroys artillery from a distance, and everything resolves itself into a duel of that arm, the first act necessary before the obstacle of the trenches can be removed. It will be easily overcome when one of the artilleries shall have triumphed in a decisive manner. The interest offered by the trench is the retarding of the decision until after the artillery duel.

The duration of this preliminary stage is more or less long. Small calibers, which fire a great number of shots at one another at relatively short range, are easily reduced to silence; a battery located is destroyed or obliged to move. On the contrary, the big guns, firing from a distance, have little chance of hitting each other; one piece is too small

a target for a range of 20 km. Their entry into action threatens, then, to immobilize the fronts. It will be necessary that the light rapid fire artillery should be numerous enough to do its work by braving their fire and charging on them up to the distance where the big guns will fall under their fire. But the putting of them out of action will always be the task of the aerial squadrons.

So we know now that the power of the defensive is principally due to the use of offensive weapons.

What makes a line of trenches invulnerable is the number of machine guns sheltered there to prevent its being approached, and of those, more in rear, which prevent its being passed; it is the storm of shell which breaks the enemy's assault before it arrives; it is the howitzer and heavy guns which neutralize the adverse light artillery. The rôle of the fortification is, however, not negligible. Its technique is being perfected.

Before leaving the trench, properly speaking, let us mention some of its auxiliaries. In the first place, wire. Barbed wire entanglements have to be destroyed by very heavy shell fire, or the assailants have to cut them under fire.

Whereas villages used to be avoided by armies in battle line, they are now powerful points of support.

The trench has its nervous system—the telephone.

There exists a machine for digging trenches or rather a mechanical plough intended to dig canals. It was invented in Belgium; the Germans took hold of it for its application to war. In one minute the machine excavates a cubic meter of ditch. In favorable ground an advance can be made of more than 100 meters an hour, or the equivalent of 200 men's work with the pick. It is very vulnerable and moves slowly, so that it can only be used in rear of the fighting front to prepare another line.

At certain places in the line, reconnoitering has discovered 32 parallel lines of German trenches. If the communicating trenches are considered, we cannot estimate at less than 40,000 kilometers the trench systems of the western front.

Future preparation for war will, doubtless, include trenches prepared in advance. Such a system would have been a great advantage to us after Charleroi and might have allowed us to readjust our forces on the Somme, instead of on the Marne.

A system of trenches along our frontiers would require the presence in time of peace of almost all our active army. In case of political tension on a single front the garrisons of the unmenaced frontier will serve as nuclei for the reserves called out by the mobilization.

(Follows a description of the installation of these trenches to be organized along the frontiers in peace time. Also a rather fanciful description of future wars, a sort of résumé, along large lines, of the author's predictions as to details.—Ed.)

[European War. Echoes of—VII—(continued). Team-work, and the Means of Secur-

ing it, by José Paulo Fernandez, Capt. of Art. Portuguese Army. *Revista de Artilharia*, Jan, '16. 2700 words.]

(The title of this article is really co-ordinations, or alliances, or communications in war. In it the author begins with a reference to the grand alliances between nations, and continues on through the supporting operations of armies, down to those of the smallest units on the actual field of battle, with mention of the relations between the different branches of the government, civil and military.)

[The Principles of War, with Reference to the Campaigns of 1914-1915. *Journal of the Royal United Service Institution*, Feb, '16. Sketches. 24,000 words.]

In the Field Service Regulations for the British army, mention is made of the fundamental principles of war and of the great necessity of their correct application to conditions, but nowhere in the book is it stated just what these principles are. Believing that ignorance of them on the part of those politicians who control our army may have been responsible in a measure for our being so often placed in positions where, outnumbered and hampered, we have only saved our skins by what are known as "brilliant strategical retreats," these principles and the conditions which govern their application are here stated.

#### *The Principles, and the Conditions Which Govern Them*

The fundamental principles are those of:

1. The objective.
2. The offensive.
3. Mass.
4. Economy of force.
5. Movement.
6. Surprise.
7. Security.
8. Co-operation.

The conditions which govern the application of these principles and must always be carefully considered are the conditions of:

1. Time.
2. Space.
3. Ground.
4. Weather.
5. Numbers.
6. Morale.
7. Communication.
8. Supply.
9. Armament.

No one of these principles is of more essential value than another, and no plan of action can be considered perfect unless all are in harmony. A perfect plan can seldom be arrived at, because the fog of war seldom rises, but the general who trusts in the principles of war stands a better chance of winning than the one who does not.

#### *The Principle of the Objective*

It has already been forcibly impressed upon us that our objective is the destruction of the military strength of the Central European Powers, and not expeditions against Turks,

Kurds, Arabs, and Bulgars. Napoleon once said, "There are many good generals in Europe, but they see too many things at once. I see the enemy's main force and I destroy it." Our objective, then, is that force of the enemy's troops the existence of which is essential to his self-preservation as a nation. Our plan of action should aim at the following: To advance against the enemy's main force (objective), with the intention of destroying it (offensive), with the greatest numbers possible (mass and economy of force), with the least friction (co-operation), and in the shortest possible time (movement), so that we may take him unawares (surprise), without undue risks to ourselves (security).

Our first difficulty is in determining which is the enemy's main force. In this war, the enemy's main army is everywhere, forming a great phalanx, with a frontage of several hundred miles. The direction of the objective then can only be discovered after a complete and careful appreciation of the conditions which govern the application of its principle.

#### *The Conditions*

The enemy being along the line A-B, our object is to destroy him, either by attacking and defeating him in open battle or by maneuvering him into an impossible position, such as one in which his lines of communication will be threatened. A modern army so thoroughly covers its front that the latter method will readily be abandoned by a nation whose superior numbers make a direct attack possible.

The direct attack may be made by engaging a flank and rolling up the front, or by penetrating the front and rolling up one or both flanks. Whichever tactical method is adopted, the two ruling conditions are time and space, which in their turn depend upon ground, weather, communications, and supply. There is no use attempting a move if time is insufficient, as in Gallipoli. There, space also was against us, for we had no room in which to maneuver, and maneuver is essential to a force which seeks to advance rapidly. Time again depends on ground and weather, and space on supply and communications. In the winter of 1914-15, when the British were waist deep in the mud of Flanders, time and space, as well as numbers, armament, and supply, all favored a German victory, but the Germans could not advance because of the rain and mud.

The two conditions, supply and communications, also affect the sorting out of the true objective. This war has proven many times that there is no use launching an attack against an objective if supply is rendered impossible, either by lack of railway communications or on account of our transport being unsuited to the theater of war.

The remaining conditions, numbers, morale and armament, are self-evident in their effect. It is not wise to challenge an enemy with half his numbers, nor to pit untrained troops against trained. The greatest mistake of all in this respect is to put our least experienced troops in the reserve, believing that the ter-

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mination of a battle will be easier than its beginning. At Loos we threw in our least experienced troops last and failed. The Duke of Wellington showed greater generalship at Waterloo when he placed his least experienced soldiers—the Belgians—in the front line. The culminating blow of the battle should be dealt by veteran troops, a *corps d'élite*, which should wear a distinctive uniform and be looked upon as the Old Guard of the army.

From the above it will be seen that there are great difficulties in selecting the best objective, and still greater ones in changing it should conditions have been misjudged.

*The Principle of the Offensive*

Will the objective we have selected enable us to apply the principle of the offensive? If not, our objective must be discarded, for the offensive is essential. In the beginning, the Germans assumed the offensive, but they were forced to abandon it on the Marne because they had abused the principle of movement by a too rapid advance, which prevented their carrying out the principles of mass and security. We lost the initiative after the battle of the Aisne on account of inferiority of numbers, bad weather, and insufficiency of armament. Once lost, it would have been folly to have violated the principle of security until numbers enabled us to put into force the principle of mass.

Just as the principle of the objective depends on the nine conditions, so also does this principle of the offensive.

*The Principle of Mass*

With sufficient numbers almost all things are possible; but seldom is an army in such preponderating strength that it can afford to neglect the principles of war.

In 1914, Germany, being superior in men, arms, and munitions, could have won the war if she had methodically put into practice the principle of mass. She assumed the offensive and swept through Belgium and France, but, surprised by the rapidity of the Russian mobilization, she violated the principle of the objective by assuming a strong offensive in the east before a decisive blow had been dealt against France. Had she harmonized mass and movement, advancing a little more slowly in the west, so as to be able to bring along another four or five corps, while putting into action the principles of security and economy of force on the eastern front, she could have won the deciding victory in France before the Russians had crossed the fortified line of the Vistula.

*The Principle of Economy of Force*

Economy of force is the correct distribution of mass. The first to violate it were the Germans, when they lost a campaign in the west by assuming the offensive in the east. We followed suit by beginning minor campaigns all over the globe. Had we had three hundred thousand of the men engaged in these campaigns to throw in at the battle of Loos,

we would have gained a decisive victory. As it was, the campaign failed, the Germans took advantage of the opportunity offered by approaching winter to invade Serbia, and we further weakened our numbers at the decisive point by landing a force at Saloniki, where there was no possibility of its assuming the offensive. We are now engaged in yet another campaign to reconstruct Serbia, forgetting that our objective is not the reconstruction of any state, but the destruction of the German Empire.

*The Principle of Movement*

Movement does not necessarily mean continued motion. Its aim is rather flexibility with the ultimate object of pushing forward. It is probably the most difficult of all the principles to judge, because it is most sensitive to the ruling conditions of the moment. The initial movement of the Germans through Belgium was too rapid. It threw their right wing in the air and left it in insufficient numbers to withstand the attacks of the French and British. The Germans made a brilliant advance against the Russians in the spring of 1915, but they were wrong in imagining that a determined people, backed by an unlimited country in which to maneuver and retire, could be beaten in a short while by mass, backed by rapidity.

Germany has violated repeatedly the principle of movement by applying movement to unprofitable ends. We, here in France, have scarcely moved a yard in a year, but we have maintained the principle of movement by its non-application. General Joffre has realized that the principle of security is paramount.

*The Principle of Security*

Security goes hand in hand with movement, for without security, movement is suicide, and without movement, security is inanition. To remain in our trenches in the hope of some day starving out the German Empire would be the height of folly, and to march on Germany, as we recently marched on Bagdad, would only mean to retire and embark at Havre.

*The Principle of Surprise*

Insecurity leads directly to surprise. Ignorance and stupidity are its dam and sire. Ignorance by our government of our own requirements, of the aspirations of our most likely opponents, of the value of modern arms, and of the principles of war, placed us in a perilous position at the beginning of the war.

In tactics, anything unexpected will surprise an enemy. Germany has surprised us with her heavy guns, her *flammenwerfer*, and her gas attacks. We surprised Germany at Neuve Chapelle by our concentrated artillery fire.

In war, surprise is essential to all the principles. Its preventives are security and co-operation.

*The Principle of Co-operation*

Co-operation is the cementing principle which binds all the others together. It is essential in war, for it reduces friction to a

minimum. In a purely military sense it means skill, confidence, discipline and determination. In its widest sense it means military efficiency and national efficiency, which, centered on one objective, impels all the life and fighting strength of the nation towards victory. Unfortunately, we do not possess this co-operation at present, but we are progressing.

## PART II. Tactical Principles

Since strategy and tactics are inseparable, it would seem that their principles must be identical, and it is true that the eight strategical principles already enumerated are just as much a part of tactics as of strategy. Yet from the fact that strategy deals more closely with men physically and with their arrangement for battle, while tactics deals more closely with men psychologically and with their arrangement in battle, we find that there are certain further principles which in their nature are more tactical than strategical. They are the principles of:

1. Demoralization.
2. Endurance.
3. Shock.

These principles apply to the trench warfare of to-day just as much as to field warfare. First, the enemy must be demoralized, that is, his endurance must be worn down by hurling missiles at him; secondly, his endurance must be broken down by assaulting him with the bayonet. To accomplish this we must resort to the attack, the aim of all tactics.

All attacks, except mere surprises and skirmishes, constitute four definite acts, namely:

1. Approach.
2. Demoralization.
3. Decision.
4. Annihilation.

Formerly the act of approach took a long time, and that of demoralization a short one. Now this last act takes months and months, while the approach disappears to appear again in a lengthy period of preparation. The act of decision is still rapid when compared to the other two, but it is lengthening out, due to the numerous lines of fortifications, each of which has to be systematically attacked. The act of pursuit will be much slower than formerly, for to-day it virtually commences a new campaign.

In trench warfare, success in the attack is much more dependent on preparation than on initiative, discipline, skill, or even personal bravery. The preparations which must be made are too numerous to discuss in detail here, but they may all be classified under the following headings:

1. The preparation for the artillery bombardments.
2. The preparation of our own trenches and the assembly of the attacking forces which will occupy them immediately prior to the assault.
3. The preparation required in order to cross the area between our front line and that of the enemy.
4. The preparation for the capture of the

enemy's defensive systems, and the advance to his artillery positions.

5. The preparation for the pursuit.

The act of preparation having been completed, the act of demoralization begins. It is no longer carried out by a lengthy rifle fight, supported by artillery fire, but by an excessive artillery fire, supported by rifles and machine guns. The rifleman of the line is no longer the true demoralizer. To-day he is but the escort of the other arms until the act of decision begins.

The most demoralizing weapon of modern warfare is the machine gun. Second only to the quick-firing guns in effect, and in killing power even their superior, it is *par excellence* the weapon which will destroy and prevent destruction. Its only disadvantage is that it cannot be employed for curved fire. For such fire, trench mortars may be used, and if our infantry were armed with mobile trench mortars in addition to their machine guns, they would be fully equipped to meet and overcome opposition from the time they leave the zone of their artillery support.

The task of the artillery in the act of demoralization has grown much more complex than it formerly was. It may be subdivided as follows:

1. To destroy the obstacles which hinder the advance.
2. To destroy the enemy's trenches so that he cannot remain in them.
3. To kill and demoralize the enemy's soldiers.
4. To put out of action the enemy's artillery, machine guns, and trench mortars.
5. To place curtains of fire in front of the enemy's reserves.
6. To build up walls of fire to safeguard the front and flanks of the attack. To do this, the artillery will have to be stronger on the flanks of the assault than on its center.

Once the assault is launched, the artillery must lift and build up longitudinal and transverse walls of fire, forming an arch or tunnel of shells, through which the assault advances. For immediate protection the assaulting forces must depend upon a shower of bombs thrown over their heads by their trench mortars and a rain of bullets on their flanks and front from their machine guns. They must not use their rifles, for now that the time for the decision has arrived, they must rely upon their bayonets.

The assaulting line should have a strength of one man per yard, so that a collective spirit may be created, and it should be preceded by picked riflemen and machine guns pushed out in advanced-saps to within 75 or 100 yards of the enemy's trenches. Each section of the assaulting line should advance at a steady walk to within 50 to 75 yards of the enemy's line, pause, fire a volley of rifle grenades, and charge home.

As soon as the attackers have carried the first line, they must reorganize to prevent mixing with and impeding the advance of the second line of assault. This second line, under cover of fire from the first line, immedi-

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ately moves forward to the assault of the enemy's next line. Thus the assault continues, wave upon wave, until the last trench of the enemy's first line system is pierced.

The general reserve, or the second assaulting force, should be advanced only when the enemy's first line system has been completely or sufficiently occupied and his second line wire entanglements have been broken. On no account should it be used to reinforce the first assaulting force, nor should it be halted in the captured trenches of the first line system. If it has to halt, it must halt in the open. The task of the general reserve is to break through the enemy's last line of defense, and not to occupy any other one.

When the reserve has penetrated the enemy's defenses, the pursuing force must at once take the field, and passing through the gap, advance obliquely against the enemy's communications, and, by forcing him to abandon them one by one, so widen out the gap that a broad road is made for the advance of the field army.

We shall not enter into the detail of the pursuit, or act of annihilation, for it constitutes a new attack embracing field warfare. The point to be emphasized is that the acts of preparation, demoralization and decision, no matter how well executed, will be of little advantage unless there is ready at the decisive moment a large, highly trained force, whose endurance has not been undermined, to immediately take up the vigorous pursuit of the defeated enemy.

Such is believed to be the true meaning of the principles of war. We have suffered considerably through their neglect. We should follow, instead, in the footsteps of the great masters of war, whose successes are directly attributable to the maintenance of these principles.

[War Notes. By Captain H. M. Johnstone, R.E. (Retired). *United Service Magazine*, Apr. '16. 4000 words.]

There was a marked change in the nature of the German operations at Verdun at the end of the first week. The attack, losing in width and gaining in violence, was showing a tendency to become localized on the small front between Louvemont and the plateau of Douaumont. The motive that led the Germans thus to restrict the scope of their work was without doubt the frightful expenditure they had to make of men and munitions. There were tons of projectiles and heaps of bodies to every yard, and it was impossible to keep it up everywhere; they were therefore forced to narrow down the front of assault, if it was to maintain an adequate impetuosity. The German theory was always supposed to envisage attack that should tend to envelopment, while in this instance they are concentrating for penetration. The battle began on the 22d Feb, suddenly and with full fury, and the French during the next few days wisely saved their strength by withdrawals. On the 26th they were back

on their main line, and began to assume control of the operation along the northern part of the front. The German attack had resembled that of the French in Champagne in 1915, an enormous preparation by artillery of all calibres, followed by the rush of wave upon wave of infantry. While the French in Champagne used their gun-fire pretty evenly all along the enemy front, the Germans seem to have gone on the principle of turning the chief weight of their artillery on successive narrow sectors, beginning with the French left. This was probably calculated to give more intensity of effect against each locality. To this was added the narrowing down of the infantry attack, laying open flanks to pressure and danger. The density of the German troops and the hail of projectiles were certainly greater than on the occasion in Champagne, showing that in two important particulars the French have achieved a predominance over the Germans, namely, in artillery work and in infantry capacity. Why should the German attack begin by gaining ground? In answer to this, we may state that the foremost trenches held by the French are not always a deliberately planned front of defense; they are rather the result of the fortune of the months of previous trench warfare, and, as such, are not worth holding at the cost of the lives of many troops. The other point is that they can never be sure that an enemy attack, even when it opens formidably, is to prove the only attack on the long front, or the chief one. Even if the intelligence department gathers information of some great preparation behind the enemy's line, it may be a blind. Therefore at the opening of the attack by the foe, all the reserves cannot at once be concentrated at that part; and if it should prove to be a vast assault, and be pushed with great vigor from the first hour, some ground must be yielded rather than let whole units be slaughtered or taken prisoners. Thus the utility and necessity of the main line are seen; it is there that the real battle is to be fought, as now on the Meuse Heights at the level of Douaumont. During the first few days, the commander of the attacked sector does the best he can with the local reserves, notifies hourly to the commander-in-chief how he is faring, and the general appearance of things; the latter warns the units of his general reserve to be ready, and to be prepared for such movement as may be ordered towards the scene of fighting.

It has been said that the Germans had come to an end of their good soldiers, while others have announced this to be wrong. The idea was that they would be fit only for defense on the western front, and would be unable to initiate any great offensive there. Those who upheld the idea forgot one point of great import. In the early summer of 1915 the English, French and the Russians proclaimed loudly to all the world that they lacked munitions to such an extent that very many months would elapse before they would be fit for serious operations of offense, and that the delay might run into the winter and cause

the postponement of attack to the spring that is now slow of coming. The watchful enemy, who had hard work to do in Russia, at once began saving his best men, especially since he was already contemplating his adventure in the Balkans. These are the men of prime fighting age, who are of great value if they are allowed sufficient time for training. This they were able to have, because they had been told their fronts had nothing more to fear for a long time to come, and they were able, therefore, to man their trenches, well enough for practical purposes, with machine guns and a large number of second-rate soldiers. Herein is seen the difference of a war capacity of a country like England or France and a country governed as Germany is governed. She too was, in the winter of 1915, short of munitions, but she could take drastic measures to fill the gap without the publicity which England and France had to exercise. England had to persuade her people by open talk that many unusual steps of interference by government were necessary, to create ministers and under-secretaries of munitions, and to send these on missionary tours through the industrial quarters of the land. The German leaders, on the other hand, never said munitions, but set to work on them in silence.

[Some Lessons of the War. By Major A. Cerf, Swiss Army. *Revue Militaire Suisse*, Apr, '16. Translation in *Infantry Journal*, May, '16. 8000 words.]

While we Swiss are awaiting under arms the end of the terrible drama which is being played under our eyes, dangerous doctrines are being propagated in the masses. There is the fatuous optimism that says, "We shall not fight! Let us disarm"; then there is an exaggerated pessimism that makes our fellow-citizens lose faith in themselves. The exponents of the latter would make us believe that because of our inferiority in battalions, matériel and machinery, we are conquered in advance.

But we must react against these imbecile sophisms, for the lessons of the war are such as to revive in us Swiss confidence and faith in ourselves.

I claim that skill, to-day as yesterday, dominates force. It is not my purpose to deduce, at the present time, infallible doctrines of combat. But I shall endeavor to expose some tactical truths from the testimony of men who have themselves been in action and in acting have seen.

I have been especially impelled to undertake this study by a recent French book, *Le Tir pour Vaincre*, by Major d'André. It is not only an eloquent plea in favor of individual fire, but also a refutation of many of the sophisms and prejudices which are current in public opinion in regard to war. It is an especially interesting study on the tactics of infantry fire.

#### *The Revenge of Fire*

"Fire has taken its revenge, and what a revenge!" writes Major d'André.

"We used to believe only in the tactics of movement. The terrible slaughter of infantry at the beginning of the campaign of 1914 has opened our eyes on this subject. Fire to kill exists only too truly."

To tell the truth, we have never doubted it. But it is consoling to learn that the realities of the war confirm the principles upon which our Firing Regulations are based. While in Switzerland all our methods, regulations and efforts tended towards making accurate shots of our soldiers, in France, before the war, it appears that this important subject, the training of the individual marksman, was neglected. In respect to fire, they still held to the viewpoint of 1870.

Thus the "firing to kill," of which Major d'André speaks, is doubtless that which the German practiced at the expense of his countrymen, for it seems that the French in general scarcely knew any other kind of fire at the beginning of the campaign than fire to frighten.

The French artillerist displayed an incomparable skill in the handling of his famous "75." On the other hand, the infantryman was not equal to what might be expected from the improved rifle and unusually excellent ammunition with which he was supplied. Aimed fire seems to have been non-existent.

"Before the war this heresy appeared: 'In combat it is better not to aim. The fire is thus better distributed.' To these apostles of skepticism, the Transvaal replied. But they immediately answered: 'But the Transvaal doesn't prove anything.' The present war has shown them in letters of blood the truth of the matter."

This pernicious doctrine also formerly had partisans among us. A few years ago it dominated the firing regulations of the armies of Europe. On the theory that war is made with collectivities and not with individuals, collective fire or volley fire was almost exclusively practiced. The soldier was considered merely as a part of a sort of machine gun which was charged with sprinkling a certain sector with blind projectiles. It was the golden age of the theorists who loaded down our firing regulations with their learned computations of probabilities and complicated cones of fire. Fire was everything, the firer nothing.

The Anglo-Boer and Russo-Japanese wars gave a serious blow to these pernicious theories, "inspired," says Colonel Montaigne, "by ignorance of and contempt for man." Accurate fire was restored to a position of honor, and the principle of individuality of the firer became the basis of all firing regulations.

The French regulations were no exception, but we must believe that, before the war, these principles were a dead letter.

On the other hand, peace instruction in Germany was given with such care that it did not vanish on the battlefield. The German Regulations make superiority of fire depend on the correctness and precision of fire and not on its intensity.

As for us Swiss, we enjoy a reputation in

**EUROPEAN WAR—Continued**

this respect which we cannot strive too much to preserve and—deserve.

*The War of Movements*

"Every one wanted to maneuver; no one wanted to fight" (*Le Tir pour Vaincre*).

The Swiss Regulations say: "Combat has for its object the destruction of the enemy. Fire is the principal means of action; movement by bringing it nearer the enemy permits its effectiveness to be constantly increased."

The French Regulations say: "Fire action has only one object—to facilitate movement."

It was this tendency of the French Regulations that Colonel Montaigne combated when he wrote in 1912: "I contemplate 'firing to kill'; the regulations, 'firing to march.'"

With this state of mind, a tactics of movement was finally created which did marvels on peace battlefields. The tactics of imposing fear were preferred to the tactics of killing. "The most serious mistakes were: the bayonet rush on all occasions and contempt for the hostile fire, the denial of the effectiveness of our own fire."

From the light of experience, Major d'André now writes: "Some have dared to say: 'Fire paralyzes the forward movement.' The fire of bunglers does so, but not the fire of good shots, since the latter clears the space in front of the rifle in an irresistible manner."

"Everything is movement, or the contrary."

"If our man—whom we would have a skilled shot—goes forward, he advances from cover to cover, not in order to secure better protection (defensive mentality), but in order to aim more effectively (offensive mentality). If he advances, it is not to frighten his adversary and cause him to flee, but in order to be closer, to fire better and more accurately, to fire more rapidly and with more certainty."

Could we ask for a better confirmation of the principles of our regulations?

*Offensive or Defensive?*

Brilliant success, at least in the beginning, crowned the application of the doctrine of the offensive, but not less striking repulses later on have brought in question the infallibility of these universally recognized principles.

What is certain is that in all cases success and failure have been dearly paid for.

"The absolute theory of the tactical offensive in all cases and at any price has cost the French as well as the German armies the flower of their youth of the first line, officers as well as soldiers" (Colonel de Payerne, *La Guerre Actuelle*).

This development should not be displeasing to us Swiss. It is, of course, less than ever a question of sheltering ourselves behind formidable and costly *permanent fortifications*, but we must more than ever train our men in the *handling of their weapons and intrenching tools*. And while continuing to inculcate in them the clearly offensive mentality of which Major d'André speaks, it is well to familiarize them with the principles of the unyielding defensive which may be imposed on us. These principles are, moreover, not

new and may be summed up as follows:

(a) A good shot never allows himself to be assaulted or dislodged from the position which is intrusted to him.

(b) Any position is impregnable when it is held by soldiers worthy of that name.

A military critic estimates that Switzerland is unattackable by forces four times greater than she can put in the field. This may or may not be so, but it is reassuring.

Everything for the cannon—nothing for the others.

"The artillery does the whole task, and the infantry advances only when the former tells it: 'Madame is served!'"

The opinion is widespread that only the cannon, large and small, and the machine guns have the exclusive monopoly of fire in the present war. The infantryman is more and more relegated to the act of the bayonet charge, and has the honor to be only a target.

We have, indeed, seen that the French infantry made a poor reputation in the use of fire, while their artillery distinguished itself. It was inevitable that comparisons should be made, but they prove nothing. "The last word will always be with the infantry, real infantry, who are real riflemen. It would be dangerous to take this very special trench warfare as a basis for the formula of the combat of to-morrow."

Artillery accomplishes its task, but not the whole task. To overturn obstacles, bar the approaches of the battlefield, in a word, support the infantry attack—that is its task. For that purpose, cannon of all calibers are necessary. We have some very good heavy cannon, and our ally, whoever he might be, would doubtless fill the gap in the heaviest types. Distinctions between arms are idle; all arms are united on the battlefield.

*The Bayonet*

The importance of bayonet combat has likewise been greatly exaggerated by our neighbors. Major d'André says that the infantryman has been often led to take his rifle for a simple bayonet handle. The school which propagated this heresy perhaps believed that it thereby fostered the offensive. But the result was pernicious. The Germans employed many means to foil bayonet attacks and to incite the "furie française" to fall into the trap which they laid for it.

At present, bayonet combats are the exception. They are almost entirely replaced by attacks with hand grenades. Of course, the bayonet will find employment in night attacks, in fog, and in the woods.

*Quantity or Quality*

Among the dogmas of the new art of war which it is desired to impose on us, there is none more generally admitted than that of the predominance of masses and matériel. Men count only by their numbers. If such theories are true, there remains only one thing for us Swiss to do—lay down our weapons, fold our arms and resign ourselves to fate.

But the dogma is false. The celebrated writer, Ardant du Picq, once wrote these



words which one could believe are dated to-day:

"The theory of the big battalion is a shameful theory. From the most insignificant to the greatest orator, everyone who talks about the military to-day speaks only of masses. And in the masses, the man disappears. People no longer see anything but numbers; they forget quality, and, nevertheless, to-day as always, quality alone finally carries thru the real action."

Bernhardi also expressly places quality before quantity. What are the campaigns of the great generals—Alexander, Hannibal, Cæsar, Napoleon—the celebrated victories of our ancestors, the old Swiss, if not the signal triumph of quality over quantity?

It cannot be argued that Belgium was quality; its army was subject to too many disintegrating influences. Serbia and Montenegro were victims of circumstances which were beyond the limits of human power. Our strategic position permits us to believe that we could successfully oppose an invader.

#### *The Masses.*

Much has been said about attacks *en masse*. A German writer says that what appeared as a mass to the defenders was really the attack in depth in which the supporting lines are near enough to each other to reinforce the firing line at the proper time. It may be that the Germans massed their less experienced troops to give them the indispensable cohesion.

Moreover, if we accept Major d'André's statement, the Germans were able on certain occasions to grant themselves the luxury of making mass attacks with impunity. Even in close formation, the nearer one approaches the less danger there is in assaulting a body of infantry which practices "scarecrow" fire, fire to create fear, which sends the bullets at random over the heads of the assailants. Under such conditions, attacks in any formation whatever could not fail to succeed.

On the other hand, to oppose to these human waves some calm marksmen, sure of themselves, some machine guns served by selected men of cool nerve is the instantaneous destruction of the mass, the infallible complete victory of quality over quantity. There is no better demonstration of the value of accurate fire, fire to kill, or to make use of a happy expression of Major d'André, "of the redeeming fire which makes the weak equal to the strong."

[The War on Land. By a Military Officer. *Army & Navy Gazette*, Aug 19, '16. 2500 words.]

(This article is a summary of the operations of the week. Certain observations only are abstracted.—Ed.)

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"It has been our experience in Artois, and that of the French in many places, that the bare holding of the summit of a ridge is difficult, and that, to be comfortably established, it is advisable to gain quickly ground down the forward slope."

[European War, Echoes of. (Continuation.)

Unity of Command. By Jose Paulo Fernandes, Captain of Artillery. *Revista de Artilharia*, Apr and May, '16. 3000 words.]

(A brief historical review tending to show the necessity of unity of command or direction in the successful conduct of war, with its application to the present war in Europe.)

[War Notes. By Captain H. M. Johnstone, R. E. (retired). *United Service Magazine*, July, '16. 4000 words.]

Infantry, though still the premier arm in battle, needs more and more the powerful help of mobile artillery. No amount of good infantry can stand against continuous artillery fire. Efforts are being made under these conditions to give the infantry a fair chance of showing what it can do. The first move in this direction has been in defense. Field fortifications in the early part of the war gave fair protection to the foot-soldiers when the guns of large calibre were comparatively few. A dozen of these firing continuously could soon reduce a small fixed fort of whatever construction. This was not so against miles of deep, narrow trenches. With the increase in the number of larger pieces, however, every yard of earthworks along extended fronts can be flattened out and infantry cannot live there. These guns cannot be silenced, since their emplacements are not visible. Besides, these emplacements can be changed at will when located by the enemy. From descriptions of the eastern front fighting, we hear that in sections not a yard of the ground was untouched, while entanglements were everywhere smashed to atoms by artillery fire. Austrian shelters fourteen feet deep, roofed with wooden beams, cement and earth, were reached by howitzer shells. The infantry in these shelters can do nothing in return; they must merely endure. The best results are obtained by leaving a minimum of defenders in the front line and protecting them against a hostile rush with a curtain of fire. The front line of trenches becomes merely advanced posts. The only way to keep a front is by a similar bombardment against the enemy, producing a "No Man's Land."

\* \* \* \*

Previous to the war, the Austrian supply of machine guns amounted to eight per battalion, against two in the British army. For the Trentino offensive, these eight were increased to twenty-four and in some instances to thirty-two. Sometimes a regiment of four battalions had also a battery of 1½-inch guns. At the beginning of the war an infantry division of four regiments had thirty-six field guns, twelve light howitzers, and six mortars; to these have been added thirty-six howitzers. The claim is that the Italians are fighting against over four thousand guns in the Trentino sector.

#### *See also*

EUROPEAN WAR—NAVAL LESSONS OF THE  
FORTIFICATIONS—FIELD—EXPERIENCE WITH  
IN EUROPEAN WAR  
LANDING OPERATIONS  
MONITORS

## EUROPEAN WAR—Continued

### —Military Situation

[The Task Confronting the Allies. By J. B. Gautreau (Paris correspondent). *Army & Navy Jour.*, May 13, '16. 800 words.]

The nerves of the French nation will prove equal to the strain of the war. Indications are that local successes are not worth their cost. Time, superiority in armament, and the economic exhaustion of the Central Powers are counted on to end the war, though many believe that the determined offensive alone will yield victory.

Though modern conflicts are more severe than those of former times, human courage has not deteriorated. It takes superhuman courage on the part of infantry to undergo the long strain of modern battle. Warned by a furious bombardment which for days precludes sleep, there ensues the meeting face to face with the foe with bayonet, knife and grenade. Individual valor is still of some weight in the balance.

New methods of training have been adopted suited to the new methods of warfare. Old-fashioned drills are used still for the reason that strict discipline and mobility by maneuver have lost none of their importance. But new points—speed in movement of infantry, aptitude in taking cover, initiative in the rank and file, hand-to-hand fighting, night marches and attacks—are now insisted upon.

[The Chances of the Allies. By Colonel Feyler, of the Swiss Army. *Lectures pour Tous*, May 15, '16. 2500 words.]

(In estimating the chances of victory for either side, one man's "guess" is as good as another's, and in general none is worth recording. But Colonel Feyler's known competency in matters military, and his rank as a writer on professional subjects and especially on the war, give his estimate unusual weight.—Ed.)

There are two ways of forecasting the issue of the present war:

- 1st, Inclusion of all the elements, for or against the Allies;
- 2d, Consideration of purely military conditions.

The second method, followed here, involve answers to these three questions:

- (a) What were the intentions of German strategy?
- (b) What results has it obtained to date?
- (c) What conclusions shall we draw from (a) and (b)?

German intentions are expressed by the peace organization of the army, and by official texts interpreted by private writings. The last reform of the German army rested on the hypothesis of a war with the Triple Entente, whose admitted numerical superiority was to be neutralized by a relative or regional (German) superiority, made all the more valuable by the quality of the elements. According to German reasoning, the enemy most to be feared was France. At the outset, she could set in the field as many combatants as

Germany, but only by calling upon all her resources in men, some of them of inferior quality. England could intervene to German detriment, but only after a lapse of time, and then only if her colonies admitted of it. Hence Germany would destroy France before England could bring any of her strength to bear.

The next adversary to be taken into account was Russia. But she was redoubtable only because of her bulk, and her bulk would make her slow. Moreover, her internal political organization would be opposed to a long war.

The military policy thus briefly sketched has been religiously followed by Germany for years in all its details. When she was ready, she struck. What happened?

The military excellence of the Imperial Government has succeeded so far in pushing out the military frontier of the Empire. But it has not put out of action adversary no. 1 (France), and it has allowed no. 3 (Great Britain) the time to set her house in order. To-day France's resources are diminished, but compensated in part by those of Great Britain, which Germany was to prevent. But Germany's resources are diminished in at least equal ratio: she has lost her qualitative and maneuvering superiority. In the west, her plan has been in fault: its execution has terminated in a set-back. In the east (Russia) no less, has the plan come to grief: the military frontier has been pushed out, and the campaign is yet to be fought out. In the meantime, adversary no. 2 has not allowed Germany to begin her definitive action against no. 3.

The German plan has failed in spite of Austria-Hungary's help. Turkey's entry has not balanced matters: it was to weaken England, but it has come to naught in this. Moreover Italy's intervention has further weakened Austria, besides being a positive support to the Allied cause. Here again the Imperial Staff has come to grief.

By the end of August, 1915, the German check was made manifest by the insufficiency of results achieved. The Empire found itself confronting the same problem as upon the declaration of war, with the relative advantage of broadened frontiers, but with the absolute disadvantage of resources diminished in a higher ratio than those of the Allies. This brings up again the question of the military organization of the German Empire. Although the primary objective of this organization was the offensive, the subsidiary necessity of the defensive had not been overlooked. Reserves to this end were to resist and wear out any hostile counter offensive. Hence at the close of summer, 1915, the Imperial Staff must have asked itself whether it should not employ its remaining resources in a program of resistance. The Balkan offensive furnished the answer. This may be regarded (a) as a fresh act in modification of the primitive program of offense, namely, a search for fresh chance, conditional by persistence of effort against Great Britain, and without waiting for the defeat of the other Allies; or, (b) it

may be regarded as a defensive act created by an offense in the Balkans, that would neutralize any intended Allied offense in that region.

If the first hypothesis be sound, then it must be announced that the results are doubtful. It is clear that as operations continue, the Germano-Bulgar-Turk group is exposed to the dangers against which the other group sought to protect itself by the Agreement of London. Moreover unity of direction and action would no longer be what it was in 1914-15, as is proved by the sudden stop of the offensive at the Greek frontier, a stop that has given the Allies time to prepare a counterstroke. If, however, we take the second hypothesis, it follows that the original intention of obtaining victory thru the offensive has been abandoned. Germany would be confessing failure. Under either hypothesis, the chances of the Allies appear to be different from and superior to their chances during the campaign of 1914-1915. In what do these differences consist?

In the first place, the check of the original German plan leaves the Imperial staff facing the same problem, providing for the same necessities, as in August, 1914. Now as then, the enemy must be so beaten as to be willing to make peace. "We are victorious everywhere!" exclaim generals, statesmen, the press. "Then why not make peace?" cries the German people. The people are right: victory will come only when the hostile armies are beaten, and the chances of this are less at the opening of the campaign of 1916 than they were in 1914. The Austro-Germans have gained the help of the Turks and Bulgars, but this is more than offset by the gain of Italy to the Allies. The Allies moreover are better off in respect of recruits, both English and Russian, and they have had time to bring their numerical superiority to bear. The Austro-Germans have widened their frontiers, but hence have relatively fewer men to hold them. The numbers of the Allies on the contrary have increased. In taking on Turks and Bulgars, the Central Powers have lost unity of direction and of action. Finally the failure of German plans, so long prepared, to reach a decision in 1914 and 1915 must be a source of anxiety, as this failure certainly constitutes an encouragement for the Allies.

In spite of the war, German commercial organization still operates with efficiency. Contracts are still honored with the scrupulous execution on which the Germans prided themselves in times of peace. But this efficiency can scarcely be a compensation for the deficiencies we have noted. It is these that will determine the issue of the war.

[A German View of the War Situation. *Army & Navy Jour.*, July 8, '16. 600 words.]

(From "Study of the General War Situation," by Major Moraht, military critic of the *Berlin Tageblatt*, written two days after the allied offensive in the west began.)

The Allies have gradually learned to launch their attacks simultaneously, and their conduct of the war has grown more energetic and

uniform. They have learned from us, and their resources and open communications make final victory more difficult. But we also have improved.

The Russian offensive has brought no relief to the western front, and the capture of several supporting points at Verdun should soon occur.

The English are going ahead systematically and cautiously, and undoubtedly have great masses of ammunition available. The very sobriety of their judgment warns us of the English determination to hold on as long as need be to insure victory. There must be an earnest settlement with England on the battlefields of the west before we come a step nearer to peace.

[Two Years of Attrition. By Colonel F. N. Maude, C. B. *Contemporary Review*, Oct, '16. 5000 words.]

War used to be a contest in a horizontal plane in which mobility played the principal part. Advantage of position in the vertical plane must now be sought.

In former days the aim of strategy was to outmarch the enemy and compel him to fight on unprepared ground. Of this phase of strategy Napoleon was the greatest exponent. Then came the invention of wire which rendered it possible to establish in a few hours an obstacle proof against assault.

The present war began in a horizontal plane and remained so until the German failure before Ypres, in Dec, 1914.

Slowly the Allied plan developed into the siege of the Teutonic millions. The new siege encounters no rigid walls, but a belt of wire entanglements miles in depth, in which must be made a breach 15 or 20 miles wide before masses of troops can be driven through. Accumulation of enemy forces at any one point of the line must be guarded against.

The German front as established in Jan, 1915, was nearly parallel to their lateral artery of communications, and this artery was too near the French line for comfort. The French saw the opportunity and began siege operations to approach this artery, confident of thus forcing the Germans to counter-attack. Thus the Germans were forced to shift troops from one part of the line to another.

A great German concentration opposite Ypres was detected in the spring of 1915, and the British offensive at Neuve Chapelle resulted. The French increased the pressure in upper Alsace, in the Woivre, and in Champagne. The Germans gave out that a great force was being concentrated north of Verdun, but this was prevented by demands for forces elsewhere.

Then came the invasion of Serbia. As soon as this was started, attacks were made at Tahure, Loos and Vimy in such force that the Germans packed headquarters' archives ready for retirement. But the Allies were not prepared to sustain the offensive, and bad weather served as an excuse for discontinuing the attack.

**EUROPEAN WAR—Continued**

Meanwhile, siege warfare continued and munitions organization was perfected. The Germans did not wait for the blow to fall, but attacked at Verdun. Time and surprise were vital, so they opened the whole of their artillery power without preliminary and were almost successful. The French did not expect the attack until 48 hours later, and for that time about 40,000 French on the spot sustained the assault of 200,000 men backed by the fire of 3000 guns of all calibers. Instead of using siege methods, the Germans continued a series of regular battle attacks, hoping thus to achieve immediate results, even at the cost of heavy casualties.

By the middle of June, the Allies had accumulated enough munitions to inaugurate an offensive which could be sustained as long as might be necessary. Raiding policy all along the line compelled the Germans to strengthen the trench guards, and constant artillery fire made the guards dig themselves in. Deep dug-outs resulted, so deep that the attackers could cross "no man's land" quicker than the Germans could get themselves and their machine guns out of the dug-outs. Before the dust and smoke of artillery bombardment had time to settle the attack swept into and over the trenches. The gunners increased their elevation and created a new screen of dust and smoke, behind which the captured ground could be organized.

Normally, the principal defensive effort is concentrated in the first zone of works. As the attack eats into the German lines, the works are found to be more and more incomplete. As the limit of their defended positions is neared, they are forced to mass men and guns and counter-attack to prevent the line being broken. But the massing of men means drawing them from somewhere else, and that point will be discovered.

If the line is broken, the operations come back into the horizontal plane and numbers and mobility will count. The French know this and are optimistic.

*See also*

EUROPEAN WAR—CONDITION OF BELLIGERENTS—GREAT BRITAIN  
EUROPEAN WAR—FORCES ENGAGED  
GREAT BRITAIN—MILITARY CONDITIONS IN VERDUN, OPERATIONS AGAINST

**—Mines**

*See*

MINES—USE OF IN EUROPEAN WAR

**—Morale**

*Austria*

[The War in Europe. *Army and Navy Jour.* Feb 12, '16. 200 words.]

British war correspondents report that according to Russian observers, the morale of the Austrian troops in Galicia is greatly improved over that shown earlier in the war. Flight and surrender are far less frequent, presumably due to the fact that the worst have thus disappeared and only the better troops remain. Punitive measures against the families may also have proved efficacious.

At the battle of Semikowice, on the Strypa, the Austrian threw themselves into the river rather than surrender.

**—Motor Transport in**

*See*

MOTOR TRANSPORT—USE OF IN EUROPEAN WAR

**—Munitions**

*See also*

EUROPEAN WAR—AMMUNITION  
METALS—USE OF IN EUROPEAN WAR

**—Munitions and Muniton Materials**

[A German View of the Munitions Shortage. Translated from the *Militär Wochenblatt. Infantry Journal*, Mar. '26. 1500 words.]

The primary causes of our enemy's munition shortage are military. The English army is a military improvisation, with all the inherent weaknesses of the latter. From the expression of complete surprise at the seriousness of the war, as made by her leading statesmen, can be surmised the lack of care in the preparations for war. England acted with no clearness of purpose in military-industrial matters. At first factories were denuded of workmen because they were required for military service. Now hundreds of thousands are being returned from the front to work in the factories. Somewhat the same condition is to be observed in France. They have not studied recent wars. We have noticed the constantly ascending curve of ammunition expenditure; from Vionville (35 cartridges and 162 rounds) to Mukden (196 cartridges and 504 rounds). We have therefore prepared for a greater expenditure. Also we were warned by Count Schlieffen that position warfare on enormous fronts was quite possible, and would require immense amounts of ammunition. For many years we have used high-angle fire guns in our field army, in contrast with other armies.

Fire training means conservation of ammunition; generally, the converse is also true. This holds for artillery as well as for the infantry. Short-service men fire where the trained man refuses to waste his shot. The blended appearance of artillery targets requires many shells now, where formerly one would suffice. England must fill out her thinned ranks at an ever-increasing rate. The training period will therefore grow shorter and the consequent munition expenditure greater. Munition shortage in the English army will not cease.

*See also*

HORSES—EUROPEAN WAR, EXPORTS OF FROM UNITED STATES  
EUROPEAN WAR—AMMUNITION

**—Munitions and Muniton Materials—Orders for in U. S.**

[Prices and War Orders. *Independent*, Jan 3, '16. 400 words.]

Prices of many articles have been affected by war demands, among them copper, which has risen from 13 to 21 cents a pound during the last year. An order has recently been placed by the British government for 135,000,000 pounds at a price of about 21 cents a

pound. Oil and gasoline have nearly doubled in price.

Among the new war orders is one from the French government for 100,000,000 hand grenades. Great Britain is in the market also for grenades. Orders for woolen underwear and sweaters are taxing the capacity of many mills. Recent lawsuits reveal Russian orders for \$6,000,000 worth of motor trucks and 3,000,000 pairs of boots. There were reports of French orders for \$28,000,000 worth of shells and \$45,000,000 worth of heavy guns placed with the Midvale Steel Co. 320 firms or companies in Canada are now at work on war orders.

[Orders for War Supplies. *Independent*, Apr 3, '16. 600 words.]

An order has just been placed with the Imperial Canneries Co., Ltd., of Montreal, for 600,000,000 one-pound cans of beef stew at a price of \$91,000,000. Most of this order has been placed in the United States.

The Canadian Bank of Commerce estimates that \$600,000,000 in war orders will be placed in Canada this year, much of which will also go to the United States.

Orders in sight for steel call for more than 400,000 tons. There is great congestion of freight at the Russian ports of Kola and Archangel, as well as at Vladivostok. Part of the supplies will hereafter be diverted from the latter port to Nikolayevsk, at the mouth of the Amur.

[Still Buying Munitions. *Independent*, Aug 14, '16. 700 words.]

Many have thought that the war orders were about over, but a second wave has come. Definite information as to all new orders is not available, but they exceed \$100,000,000. There is an order for \$12,000,000 worth of shells from the Midvale Steel Co.; three of \$18,000,000 each; one of \$22,000,000 to a Western company that will erect two new factories; and a contract for 600,000 fuses. New orders of \$300,000,000 will, it is predicted, be placed here within the next six months.

(Details of orders are given.) It is to be noted that the new orders are for shells of large caliber, eight to twelve inches. England and France are making enough small shells.

[Note. *Army & Navy Jour.*, Sept 16, '16. 150 words.]

By a statement from the Department of Commerce, exports of war munitions from Aug 1, 1914 to Aug 1, 1916 have been:—cartidges, \$58,620,663; gunpowder, \$206,875,154; other explosives, \$308,755,201; firearms, \$30,362,827; total \$604,614,028. By years, the exports were:

Aug 1, 1914 to Jan 1, 1915 \$9,235,501.

Jan 1, 1915 to Jan 1, 1916 \$199,627,324.

Jan 1, 1916 to Aug 1, 1916 \$395,751,203.

See

EUROPEAN WAR—AMMUNITION

—Naval Lessons of the

[Navy Secretary on Lessons of the War. *Army & Navy Jour.*, Dec 18, '15. 2000 words.]

In a report to Congress, the Secretary of the Navy expresses the belief that dreadnoughts and battle cruisers will determine control of the sea, but that all necessary types should be represented. No decisive naval engagement has yet been fought, but the main British fleet has maintained control of the sea, and it has not suffered seriously from submarines. By the end of 1915, fifteen capital ships will have been added to the British navy.

The command of the sea and the attendant security of the coasts will belong to the power possessing ships which in the aggregate have a preponderance in armor, armament, speed, and radius of action. Our vessels are limited practically by the size of the Panama Canal locks, so that the practical limit of size is reached in the *California* class. A five-year program is proposed, giving a balanced development, without committing ourselves too far in the future.

Although the dreadnought merits designation as the type "best suited for war at sea," a well-rounded navy is essential. Small cruisers have shown their value as commerce destroyers, and in every action of importance in the North Sea area battle cruisers and scouts have taken the leading part.

Aeroplanes have been used principally in land operations, but they have shown their value as naval auxiliaries, and a large number of belligerent vessels are now fitted for carrying aircraft. A prominent officer of one of the belligerent powers has testified forcibly to the value of aeroplanes as being "one of the most rudimentary necessities of every army and navy in the world." An adequate supply of machines, pilots and observers is required for the aerial service.

The submarine type was well developed at the outbreak of war, but the defense and counter offensive against them was undeveloped. Now that suitable measures for the latter have been developed, submarine operations are increasingly difficult and hazardous. The success of the defense is shown by the fact that the strength in capital ships has not been seriously impaired by submarine operations in the case of any of the belligerents. An adequate number of submarines must be included in any well-balanced project of construction. Many of these conclusions are based on confidential reports.

[Use of Monitors in the Danube. *The Canadian Military Gazette*. Feb 22, '16. 300 words.]

As a result of the operations in the Danube all the nations now at war have found that the monitor is still a useful tool of offense and defense. Reports show that Austrian river monitors have proved of immense value in the operations against the Serbians. They were instrumental in breaking up the blockade of the Danube established by Admiral Troubridge. The Austrians at one time had 7 or 8 monitors on the Danube—vessels from 305 to 527 tons, armed with 4.7-inch guns and with speeds from 8 to 13 knots. They were protected by deck, turret and side armor, and

**EUROPEAN WAR—Continued**

varied very much in age; some having been built in 1871 and reconstructed in 1894, while still others were almost entirely new.

**—Naval Operations**

*See also*

JUTLAND, BATTLE OF

**—Naval Power in**

*See also*

GREAT BRITAIN—NAVY

**—Neutrality Aspects of**

[Zeppelin Telegrams. *Holland Gazette*, Nov 5, '15. 300 words.]

The Holland government has prohibited telegrams of warning being sent to England concerning approaching Zeppelins. Such a prohibition has never before been issued by neutrals, but it is sound in principle if there is a like prohibition against telegrams concerning British fleet movement being sent to Germany. However, it is not likely to be effective, so long as there is any communication at all. The most innocent private message may contain a warning.

**—Peace Negotiations**

[The Peace which the Germans would like to make. Letter to all the French, by Ernest Lavisse, President of the Committee of Publication. Translation in full from Supplement to the *Illustration*, Jan, '16.]

"Patience, effort and confidence."

The best means of keeping, in the emotions of the present hour, the firm patience which will make victory sure, is to consider exactly what would become of us, if Germany should be victorious.

Now, Dec 9, 1915, a German Socialist deputy asked the Chancellor of the Empire on what conditions the imperial government would make peace, the Chancellor replied by obscure words; but a deputy of the majority, Mr. Spahn, declared that peace must insure "by all methods, including the necessary territorial acquisitions, all the military economic and political interests of Germany throughout its whole extent." These words were followed, the German newspapers say, "by a thunder of applause." Mr. Spahn had, indeed, expressed the wish of Germany.

This wish is known to us from the words of Emperor William, from writings by statesmen, philosophers, historians, scholars; but it appears nowhere more clearly than in a memorandum addressed to the Chancellor of the Empire by the six great industrial and agricultural associations of the Empire, the League of Farmers, the League of German Peasants, the Tentative Grouping of the Christian Associations of German Peasants, the Central Union of German Industrials, the Industrial League, the Middle Class Union. At the very moment of the publication of this memorandum, which was supposed to be secret, and which, on that account, speaks with fresh effrontery—there appeared a statement signed by prominent Germans, professors for the most part. This statement corroborates the memorandum. Let us see, then,

what these two documents contain. *It is important that all Frenchmen know it and understand it.*

I. How the Germans reason.

We must first admire the simplicity of the reasoning, which is as follows:

Germany was, half a century ago, a country essentially agricultural; she has become a country essentially industrial; *now*, it is important to the healthy condition of a state that an exact equilibrium should be established between these two resources; *therefore* Germany needs to reinforce her agricultural foundation.

In order to reinforce her agricultural resources Germany must procure a "*terrain for German colonisation of great extent*"; *now*, the terrain of this extension is clearly indicated; it is situated to the east, in the Russian plains; *therefore*, Germany will have to provide for herself agricultural lands in Russia.

The enlarging of the agricultural field will permit a new boom of industry; but Germany will have to be richer than she is today in iron ore and coal; now these substances are found on the west, in the "*arrondissement*" of Briey, in Meurthe-et-Moselle, in our departments, du Nord and of le Pas-de-Calais, and in Belgium; *therefore*, these must be annexed, the region of Briey, the coal lands of le Nord and of le Pas-de-Calais and Belgium.

It remains to regulate the fate of the annexed countries. "*All the means of economic power existing in the annexed territories, including the property of large landholders and the middle class will pass into German hands.*" That is to say that all the industry, except perhaps that of trades carried on at home, and all the agriculture, save that on a small scale will become German property. The Germans deem it just that the dispossessed should receive an indemnity but who will pay it? Answer: "*France will indemnify the property owners and will absorb them.*"

This reasoning, so tranquilly cynical, would astonish us if we were not already acquainted with it. It is exactly, indeed, that of bandits who, philosophizing over their crimes after the manner of Bonnet and his friends, claim the right to "live their life," that is, to satisfy their needs and their tastes, of which they have the pretension of being the sole judges. Contrary to the laws, which they reject because embarrassed by them, they have recourse to theft and murder and boast of it. Germany also wishes to "live her life"; she draws up the catalogue of her needs; she needs this in the east and that in the west. She is ill at ease in Europe and in the world such as it is to-day; in order to make for herself a place that suits her she resorts to war, which is for her the great, glorious, holy task.

And to think that, among the signers of the memorandum, is found the "Group of German Christian Associations"; and among those of the statement, the Sieur Seeberg, professor of theology at Berlin! Detail to be

noted by anyone who would undertake to define German Christianity and the soul of the old god of Emperor William.

II. They wish the dismembering and ruin of France.

Memorandum and statement breathe especial resentment against France and Belgium. The Germans do not hope to destroy Russia; they wish to push her back. They do not hope to destroy England; they wish to take from her the empire of the seas and to take precautions against her in view of a future war, for the associations and the professors foresee and predict for humanity a whole future of war.

Belgium, on the contrary, will disappear purely and simply: *"We have conquered it, they say, at the cost of the noblest German blood. Our people are unanimous in wishing to keep it. Keeping Belgium is, undoubtedly, a question of honor for us."* A word to be retained by him who will undertake to define the meaning of the word "honor" in the German language.

As for France, there will have to continue to be such a country, unfortunately, and our enemies do not yet speak of suppressing it altogether; but, in the first place, she will cease to be a colonial power. *"We cannot forget that France possesses a colonial empire disproportionately large and that England might seize it if we do not put our hands on it."* And that is the reasoning of a thief who would admit his crime but who would be astonished if someone reproached him for it and would say: "Well, if that man had not been robbed by me, he would have been by somebody else."

Here now is the fate reserved for Continental France. *It is for us of vital interest to possess the coast region adjoining Belgium, about as far as the Somme; no longer, of course, the country back of that coast, that is to say, as we already know, the country du Nord and du Pas-de-Calais; but something besides; "the back country that must be acquired at the same time should be extensive enough so that, economically and strategically the ports where the canals end may be of the proper importance."* This sentence makes apparent the desire to prolong the annexations to be taken from our northern departments so that they will meet the annexations of our eastern departments.

On this side, in the east, it is not alone Briey that the Germans claim. Briey they want for economic reasons, but they have to take into account other serious reasons. Let us listen with all our attention. *"After the experiences of this war, it is very natural that we should not expose our frontier to new enemy invasions by leaving the adversary the fortresses which threaten us, especially Verdun and Belfort."*

This is one of those sentences such as the Germans write and that one does not know how to describe; "stupefying" does not suffice. When you hear them, you are stunned as by the proposals of a madman.

Everybody knows that Germany has grouped on her French Frontier and in the country back of the frontier the most formidable paraphernalia of military power. A number of Germans of high rank and the pan-Germanist mob have warned us that they have decided to finish us up some fine day (and we would not have had the right to defend ourselves). All these German fortresses, these strategic lines, this accumulation of forces on our frontier did not menace France; but Toul, Verdun, Belfort threatened Germany! That was all right and the Germans were free to talk to us as the wolf talks to the lamb in the fable. They know now that we are not lambs. Let us go on to the conclusion; the Germans claim *"the line of the Meuse."* Now, if they should acquire that line, France would lose all or part of the departments of the Ardennes, Meuse, Meurthe-et-Moselle, the Vosges and the territory of Belfort.

Is it enough to take away from France those territories of the north and east, which produce, as is well known, a third of the total fortune of our country? No, that is not enough; this dismembered France must be exhausted. *"The French danger must be settled once for all. Let us not try efforts of reconciliation; to these France has always opposed the most extreme fanaticism. In the interest of our own existence, we must weaken that country politically and economically, without any consideration whatever. It is necessary to impose on France (and even among our adversaries, France occupies the first line) a large war indemnity, without any regard for her."* Since they did not dare to name the figure, it must be enormous; currently in Germany they talk of twenty billions, some of thirty, some even of forty billions.

III. Advice to the Impatient. Duty of Patience.

In their statement, the German professors are disturbed, it seems, to find in their country good people capable of clemency to the conquered, because they believe in the possibility of reconciliations in the future, and also nervous people who would be glad to have it over, for the peace of their nerves.

If there were not among us some people of this kind, it would be too great a miracle; so there is a certain number of them. They aspire to peace; they listen to the rumors of it circulated from time to time; they believe in the possibility of an acceptable peace; after the war, national life would go on again, as before, or nearly so; they aspire to this gentle condition. The memorandum and the statement have come opportunely to undeceive these poor naive people.

Let us consider once more, indeed, the future which they promise us.

To begin with, financial ruin. In order to pay the enormous war contribution swelled by the indemnity to the dispossessed of the north and east, France would necessarily be overwhelmed by taxes. He who earns painfully 4000 or 5000 francs a year would be

### EUROPEAN WAR—Continued

obliged to turn most of it into the public funds. Worthy people of income, who have, let us suppose, 50,000 francs a year, do you know that the budget would exact from you two-thirds or three-fourths?

And then how could the income on government bonds or values guaranteed by the state be paid? How pay pensions, retired pay and our sacred debts to our invalids and the families of our dead? Who would aid our villages and our cities to build on their ruins, our manufacturers to get on their feet and to resume work? Where would the workmen of our country districts and cities find salaries permitting them to live? *The victory of Germany would be, for the vanquished, bankruptcy, followed by universal and incurable poverty.*

The Germans promise us better yet: the extremity of shame.

We should lose that colonial empire of which we are justly proud, for it was conquered by the blood of our soldiers, organized by the intelligence of our military and civil administrators, and so well, so humanely governed that France is for the natives a mother-country for which they die. France would be limited by the Somme and the Meuse! Why, those two rivers were precisely the limits given to her when, in 843, the grandsons of Charlemagne divided his empire. *Withdrawing to the Somme and the Meuse would be to retrograde 1072 years.*

Finally, France, mutilated, bled to the limit, exhausted, would live the contemptible remainder of her life under the command of Germany. Germany, who judges that we do not know how to work, would direct our commerce and our industry. Perhaps she would begin to choose among us some overseers. Germany would teach us even to think for that nation, where intelligence has made itself the handmaid of Prussian militarism and declares that it cannot live without that régime, where, moreover, intellectual decline is certain, imagines itself to be, in all the sciences, the instructors of the human race.

Therefore, I ask all Frenchmen, I ask any Frenchman: "Rather than permit the destruction, through the dismemberment of France, of the work of so many centuries of ancestors who created the French nation, rather than pay, we France, tribute to this Kaiser and his people, rather than descend from the high rank we hold among humanity to the condition of an inferior people, of a subjugated people; rather than we, free France, we France, liberator of so many peoples, be reduced to servitude—I ask, Would we not a thousand times rather die?"

But it is not a question of dying, for Germany will not be victorious. She is still strong; her very madness, her madness of pride, contributes to her energy; but this madness has inspired her with ambitions which could not be satisfied by an energy and a strength ten times greater. She has won victories; she will win some more, doubtless; but she cannot, in the long run, overcome the com-

bined forces of countries which call themselves England, France, Italy, Russia. These forces, we propose to draw up a table of them and to compare them to those which Germany has left. This comparison is one of the grounds of our invincible hope; it is a comfort to our patience.

Let us remember, all of us, that patience is the courage of the non-combatant. It is his weapon, his defensive arm against the agitations of prattlers of both sexes, insupportable peddlers of ill-considered statements and against the suggestions of selfishness which are able to lead so far those who do not feel the infamy of them.

*Fortunately, our people know, by their sure instinct, that the war Germany is making on us is a war to the death, and their patience remains firm, because they have faith in the immortality of France.*

### —Photography in

*See also*

### PHOTOGRAPHY—USE OF IN EUROPEAN WAR

### —Prisoners

#### Germany

[Feeding the Prisoners of War. By Our Berlin Correspondent. *Scientific American*, June 17, '16. 1200 words.]

The problem of feeding prisoners has been complicated by their enormous number and by the existing economic conditions. The German War Department arranged a course of lectures for commissary officers of prisoners' camps. Officers from 129 different camps attended these lectures, which covered various articles of food, bills of fare, alimentary physiology, bread supply, food storage, employment of prisoners, the rôle of sugar, the food value of the soya bean, meat and fish supply, test of food, canteen operation, etc.

The normal daily amounts of nutritive substances allowed for each prisoner are: 85 grammes of albumen, 40 grammes of fat, 475 grammes of carbo-hydrates, with a total of 2700 calories. For laborers, an increase of 10 per cent. is allowed. A sample bill of fare is given. Breakfast: Coffee with sugar or preferably a soup with 100 grammes of solid substance in it. Midday meal: 750 grammes of potatoes and 300 grammes of vegetables, supplemented by 100 grammes of meat three times a week. Two hundred grammes of fish may be given on two additional days, with certain equivalent additions on the two remaining days. Supper: 600 to 750 grammes of potatoes in their skins, with 150 grammes of herring or 100 grammes of sausage or cheese.

Special characteristics of prisoners must be taken into account. The Russian must be given tea. The particular articles of diet and methods of preparation affected by Orientals must be recognized.

### —Railroads in

[German Military Railroad Organizations at Work. *Scientific American*, Mar 18, '16. 2000 words. Illustrated.]

(Gives a description in general terms of the tremendous task that confronted the German



railroad service at the outbreak of war. In addition to operating the railroads, provision had to be made to reconstruct after the extensive destruction effected by the Allies. Since the beginning, 104 large bridges have been constructed, 8 tunnels have been rebuilt, and 14 important main railroads have been restored. The illustrations show some of the bridges reconstructed, in one case one 591 feet long and 108 feet high. No details of organization or methods are given.)

*See also*

NISE-CONSTANTINOPLE RAILROAD  
RAILROADS—USE OF IN EUROPEAN WAR  
SALONIKI-BELGRADE RAILROAD

—Raw Materials of War

[Strategic Moves of the War, December 30, 1915. By Our Military Expert. *Scientific American*, Jan 8, '16. 1800 words. Map.]

(The territory opened up to the Teutonic Allies by the recent operations in the Balkans is discussed in its bearing upon food and munitions supplies of the belligerents.)

The available reserve food supply of Bulgaria, Turkey, and possibly of Rumania, has become available for the Teutonic allies. Certain cereals are grown in northern Mesopotamia and some will be available for export, but Turkey is neither a wheat nor a corn country. Northeastern Bulgaria produces a considerable quantity of wheat, and other wheat lands are to be found in Rumania. How much wheat the latter will permit to be exported is a question. Russia has a large wheat-growing area 300 to 400 miles wide on the north shore of the Black Sea, and it is probable that sufficient labor is available to insure a full crop. The sugar-beet area of Russia is immediately behind the present battle line north of Bessarabia.

Russia has iron north of Rostof, near Tiflis, and west of the Caucasus. Turkey has iron south of the Sea of Marmora, and along the northern shore of the Mediterranean from Smyrna to Alexandretta.

Copper is found in limited quantities in southern Bulgaria. Turkish production is limited to one locality on the south shore of the Black Sea, and it is without rail transportation. Russia has copper mines 100 miles south of Tiflis, near the railroad.

Lead is found near Angora, near Eregli on the Bagdad line, and south of Smyrna near Sokia. Zinc, manganese, iron and coal are also found at the latter point.

There are small coal deposits in Bulgaria, and a certain amount in Turkey on the south shore of the Black Sea and southeast of Smyrna. Russia has enormous coal deposits north of Rostof and also east of the Black Sea.

Turkey has no petroleum except near Bagdad, and Bulgaria has none. Rumania produces more petroleum than she needs, and probably supplies some to the Teutonic allies. Russia has rich petroleum fields in the area between the Black and Caspian seas.

Cotton is produced along the northern and northeastern shores of the Mediterranean, and some of this is available for Teutonic use

Probably five times as much cotton is supplied to the Allies by Egypt.

The food and mineral resources of Turkey and the vicinity probably do not offer any great material benefit to the Teutonic cause. The section has never been noted for exportation of foodstuffs. Only the Scutari-Bagdad-Medina railroad can be used to transport such supplies as are available.

—Relations with Neutrals

*South America*

[The Economic Phase of the Present European War and Its Future Influence on South America. By Major P. Charpin. *Mem. Estado Mayor* (Chile), June, '16. 1700 words].

The well-known aphorism that war needs money, money, and more money, has been confirmed in the present struggle in a way that surpasses any previous conception of the subject. A review of the cost of war and of its financial wear and tear bears out the above statement.

The economic situation created by the fourfold increase of the public debt of the countries at war can be met only by a marked advance in all taxes. In the end, this burden will fall on every industry, and in all these countries the producer will try to make up this burden at the expense of the consumer.

The other producing countries, which are not directly affected by the war, will not neglect the opportunity of raising the prices.

Germany, Austria, Belgium, France, England, Italy, Russia and Turkey own the most powerful merchant marine in the world; all these countries, for a long time to come, will remain the arbiters of the maritime traffic and of its cost. In the long run, South America will have to bear the brunt of the results of the war.

The manner in which this serious problem is to be solved will greatly and directly affect us, as we are forced at the present time to supply ourselves almost entirely from foreign markets, being wholly dependent on the European merchant marine.

South America, especially Chile, will have to adopt adequate measures in order to protect herself from European prices. We should, right now, organize our means of action and of defense. These are: development of industries; improving of all land communications; reduction in freight rates; effective support of the national merchant marine; and the establishment and cultivation of commercial relations with the other American countries finding themselves in the same conditions.

We should make greater provisions in our budgets for the prosecution of public works, the influence of which has a more or less important bearing on our commercial, industrial and agricultural capacity.

Several of these problems may be taken care of, once peace is established, by the immigration of European capital; but the larger number of them require an immediate solution, otherwise capital will seek elsewhere for more favorable fields.

## EUROPEAN WAR—Continued

## Switzerland

[Switzerland and the War. By Jacob Preston. *The Contemporary Review*, Sept, '16. 5000 words.]

Switzerland is officially neutral. But of the total population of nearly four millions, 70 per cent is German speaking, 21 per cent French, and 8 per cent Italian. Identity of race and language influences the individual and the community view-point.

Diversity of language, seemingly an objection from the standpoint of national unity, is really the safeguard of Switzerland. A single language would make the bond of sympathy and understanding too strong in one direction.

Evidences of diversity of opinion and feeling between the Latin and Teutonic Swiss are not lacking, but this difference is insignificant compared with the difference between the Teutonic Swiss and the German.

The attitude of the average German-Swiss is complex. He understands and sympathizes with the Germans and admires their achievements, yet would not like to see the Teutonic allies emerge from the war completely victorious. The French-Swiss equally sympathize with the Allies, but they are first of all Swiss and would, however reluctantly, defend their frontiers even against the French. Nothing short of starvation or threatened invasion could drive Switzerland into the war.

Switzerland is in a trying position. Undue partiality would almost certainly re-act disadvantageously on the economic position of the country. Switzerland gets her coal from Germany and 60 per cent of her food-stuffs from France and Italy. Importation trusts have been formed to operate under these delicate conditions.

The German sentiment which prevails in German-Switzerland has, for various reasons, considerably diminished since the early days of the war. In Latin-Switzerland, sympathy for the Allies is keener than ever. But the cry "Switzerland for the Swiss" dominates.

Switzerland is so situated as to be able to derive no benefit from the war, and in many ways she suffers hardship. The dominant thought in the minds of most Swiss is an intense longing for the speedy end of the war.

[Belgium and Swiss Neutrality. By L. Rev. *Mil. Suisse*, Mar, '16. 2000 words.]

Different newspapers have called attention to the fact that Belgium did not officially subscribe to the agreement of London. So the inference has been drawn that a separate peace is possible between Belgium and the Central Empires.

The German Government can hardly have offered more than the *status quo ante* with a good commercial treaty putting Belgium under the economic dependence of Germany. But the moment may come when Germany will be glad to have one enemy fewer to fight and 150 kilometers less frontier to defend.

The chief point of interest for us Swiss is the consequences that this peace might have on the maintenance of our neutrality and our national independence.

One basis of peace might be to offer Belgium Luxembourg and such Rhenish territories as formerly were a part of Belgium (before the Congress of Vienna).

The Powers of the Quadruple Entente would probably frown on such peace projects. However, the re-establishment of Belgian neutrality would not be without its advantages for them. It would relieve them of the obligation of reconquering Belgium. Besides France would recover a large part of her invaded territory.

Since Belgium did not subscribe to the agreement of London, she has incontestably the right to make peace whenever she wishes and how she wishes. It is not impossible that the neutrality of Belgium be suddenly re-established before the end of the great war.

What would be the effect of such an event on the neutrality of Switzerland? The best answer to that question is to remember how relieved we were when we knew that the main effort was to be put forth to the north. Should Belgian neutrality be restored, both belligerents might enter our territory.

[Editor's note.—Since the foregoing was written, Baron Beyers, minister of foreign affairs of Belgium, has declared complete confidence in the Entente Powers and the determination of Belgium to fight until right triumphs. This may be regarded almost as an adherence to the "Pacte de Londres." It will be noted, however, that Belgium does not promise to fight until the end, but until the triumph of the right, which is not necessarily the same thing. But the spirit, if not the letter, does not appear doubtful.]

[Passage of the Evacuated Across Switzerland. By Capt. Herce, Military Attaché. *La Guerra y su Preparación*, Aug, '16. 1200 words.]

(A brief account of the generosity shown by the Swiss to persons driven out of the country of their residence by the war, and to neutrals in like case. It is computed that more than 500 evacuation trains have been formed, and that about 110,000 persons have been repatriated. The clothes distributed at the various stops are valued at about \$200,000.)

## United States

[The Effect of the War on American National Life. By Hudson Maxim. *Harper's Weekly*, Jan 8, '16. 2500 words.]

Upon the conclusion of the war in Europe, the United States will be called upon to face the veteran troops of an invading host. The attack may come from the East and it may come from the West. If the blow be struck upon the Atlantic sea coast, most of our war munitions factories will be at once captured, and worked by the enemy to our disadvantage. A tenth part of the ransom to be paid would so prepare us against attack that no foreign foe would dare to invade us.

This ransom paid, our people will have learned a very useful lesson, that a wealthy and populous nation must be prepared to defend itself in the ratio of its wealth and population. The American people, blinded by the pacifists, have simply refused to take this lesson to heart in advance; they can now learn it only in the school of experience. When they do, they will have discovered also that not all wars are bad.

See also

#### MONROE DOCTRINE

##### United States-Germany

[The American Ultimatum. By Arthur Pollen. *Land and Water*, Apr 27, '16. 3000 words. One diagram.]

The past week has been marked by momentous events. The long expected ultimatum to Germany has been dispatched: Lowestoft and Zeebrugge have been bombarded: an attempt has been made to land arms in Ireland.

Two points are noteworthy in connection with the Lowestoft and Irish raids. In the first, the safety of the ravaging cruisers was secured by Zeppelin reconnaissance. Would the possession of similar craft by us have made it too dangerous a venture? The combination of the cruiser and submarine in the Irish venture must be kept in mind by patrolling squadrons when they search seeming neutrals.

The German Government now faces a difficulty with America from which there is no outlet that is not disastrous either to its home prestige or to its military hopes. The landing in Ireland and the bombardment of Lowestoft are diversional attacks for the purpose of turning German civilian attention from this, the most important issue of the day.

Submarine attacks will become more ruthless if German public opinion compels a defiance of America.

America as an ally could help but little to combat the submarines. Fast, well-armed light craft are the only effective naval defense against submarines. The American Navy is conspicuously lacking in these craft.

The American ultimatum gives a final shape to the judgment of the neutral world. The largest neutral state has spoken with due deliberation, and with its protest has put a term to its neutrality. The thing is a portent when we remember that no country is less prepared for or less desirous of war than the United States.

#### —Reports of Atrocities

[Germany's Violations of the Laws of War. *Rivista di Cavalleria*, Nov, '15. 900 words.]

The Italian press has reviewed this interesting book, published in London. The book consists of more than 130 photographic copies of original documents found on German dead, wounded and prisoners in Alsace, Argonne and Flanders, and of some reports by French officers.

The memorandum of a soldier named Fahlenstein, 34th Fusiliers, 2d Army Corps, says: "They (The French) were found in groups

of eight or ten, wounded or dead, one on top of another. Those that could still walk were made prisoners and taken with us. Those that were seriously wounded in the head or chest and could not stand up, were finished with another bullet. Such were the orders received."

There are some diaries of officers that complain of these things.

No comment is necessary, but it would be well if this book could be translated into Italian and given the widest possible circulation.

[Killing the Wounded. By William J. Robinson. *Independent*, May 29, '16. 2100 words.]

(In an editorial note it is stated that the author is a young Bostonian who enlisted in the British army in Aug, 1914. He was promoted sergeant-major, was wounded once, and after fourteen months at the front he returned to America. His story is a record of actual experiences.)

In the spring of 1915, the French Algerian troops at a certain point on the western front were surprised by a gas attack, retreated from the position and exposed the British flank at the point of junction. 1500 staff troops were rushed in to hold the gap if possible until reinforcements arrived. These proved to be Canadians and they went straight into action, driving back the Germans who had penetrated through several lines of trench. Trench after trench was captured, and "if there were any Germans left in them they died quickly, for Canada was showing her fighting spirit, and it was a case of hack, stab, shoot, club," any way to drive the Germans back.

After half the ground yielded had thus been recovered, German reinforcements arrived and the Canadians were forced to yield most of the ground recovered, leaving many wounded behind. A later advance by the Canadians showed that the wounded left had all been killed.

This was the beginning of the awful practice, rumors of which have reached neutral countries, which has been carried on and is being carried on even now. Reports that prisoners are not taken are untrue, so far as the Allies are concerned.

After an engagement near Hooze in the summer of 1915, German sharpshooters shot wounded trying to return to the trenches, and British troops retaliated. The feeling between the troops is extremely bitter, a case being cited.

[The author states that he cites only cases that he has seen.—Ed.]

#### —Russian Expeditionary Force in France

[The Russians in France. *Army & Navy Jour.* Apr 29, '16. 700 words]

A second contingent of Russian troops landed at Marseilles on Apr 26, the first having landed on Apr 20. It is reported that 250,000 Russian troops will be sent to the western front. Russia has plenty of men, but few officers and drill masters. One theory is that the men are being sent to France for training, another that they are there to fight

**EUROPEAN WAR—Continued**

as a testimonial of the friendship and admiration of Russia for France.

**—Sanitary Service in**

[The War in Europe. Note. *Army & Navy Jour.*, Dec 4, '15. 100 words.]

The British Admiralty states that there are 40 hospital ships plying to and from the Mediterranean, transporting only ill and wounded soldiers, nurses and members of the medical staff, and medical stores.

[Bringing the Wounded from the Front. *Sphere*, Dec 11, '15. 500 words. Illustrated.]

The medical organization in the field is under a Director of Medical Services, who is responsible for the technical working of all units and branches of the medical service within his army, and has under his control the large clearing stations established near the railway, the motor ambulance convoys, and all sanitary arrangements within his area. The divisional formations are under the Assistant D. M. S. of the division, who controls the field ambulances, dressing stations, aid posts, and sanitary sections of the divisional area.

As an example of the working, a soldier wounded (say) in an advance, is rescued as soon as practicable by stretcher-bearers and taken to his "regimental aid post," located in a dugout, cellar, or like protected spot, where he receives first aid from his battalion R. A. M. C. officer. Thence he is conveyed by stretcher, or, if practicable, by horsed ambulance wagon, to the nearest dressing station. Once in the ambulance wagon, he passes into the charge of the Divisional Field Ambulance, the advanced dressing stations of which are as far to the front as possible. Here the wounded soldier is carefully attended to and injected with anti-tetanus serum. He is then taken by motor or horsed vehicle of the divisional field ambulance to one of the larger dressing stations situated in some suitable building further to the rear, where he is made as comfortable as possible and is given food and drink.

The next move is to a casualty clearing station, generally situated at railhead, so that a patient can be carried thence directly to an ambulance train, the position being chosen to facilitate the movement of the wounded onward by ambulance or train. At the casualty clearing station, the wounded soldier first comes under the care of female nurses and reaches the luxury of a bed. The stay here is usually only a few hours, when he will be placed on board a train, leaving the "Collecting Zone" and entering the "Evacuating Zone," and passing from the charge of the medical authorities into that of the line of communication.

On arrival at a base, the wounded man is transferred by motor ambulance to a fully equipped permanent hospital. These are of two kinds—general and stationary—depending chiefly in distinction upon the number of patients they are designed to accommodate.

Wounded unlikely to be fit for duty in three weeks and who will not be harmed by further

transport—and this includes by far the largest number—are sent to England by hospital ship as soon as accommodation is available.

[Medico-Military Facts of European War. *Army & Navy Jour.*, Jan 8, '16. 1800 words.]

(Further comments on "Medico-Military Aspects of the War," by Surgeon Fauntleroy, U. S. Navy. Government publication.)

In the early part of the war, aside from the heavy guns used against the Belgian fortifications, the light field gun was principally used, and shrapnel was its principal ammunition until the trench warfare developed after the battle of the Marne. Field artillery is playing the dominant rôle in the war.

After the battle of the Marne there were 112,000 wounded, mostly German, to be cared for. There were practically no contagious diseases at the beginning. Red Cross dogs are used at some parts of the front to locate wounded. Lately they have been trained to carry ropes to the wounded in front of the trenches, so that the wounded can be dragged in.

No statistics are given out by the French government, but a French surgeon of considerable experience estimates that up to July 30, 1915, there had been a fraction over 900,000 French casualties. Sixty per cent of the British wounded return to duty, and the French percentage is estimated at 54.5 per cent; 1.47 per cent are permanently disabled, and 2.48 per cent die of wounds.

Much experiment has resulted in the adoption of an aqueous solution of 0.5 per cent concentration of sodium hypochlorite as an antiseptic, and it has proved very effective.

Typhoid is greatly reduced, but not entirely eliminated. Only 70 per cent of the British have received anti-typhoid injections, and they had 650 cases of typhoid to March, 1915.

The system of surgical treatment has been a compromise between the ideal hospital treatment under normal conditions and the overwhelming amount of work to be performed.

Due to easy cultivation, the soil of the western theater is full of infective organisms, and under trench conditions the clothing becomes thoroughly permeated, with corresponding prevalence of sepsis.

Puttees, with long standing and the damp, cold trenches, have developed various forms and degrees of parathesias. The Belgians, who wear no puttees, escape this trouble. Good, well-fitting shoes are an important factor, and the excellent shoes used have undoubtedly been chiefly instrumental in keeping the frost-bite cases small in number.

Trench fighting has served to increase both the percentage of shell wounds and the percentage of head wounds. A remarkable feature of trench warfare is that in looking out through a port or periscope, no living thing will be seen for hours at a time, though thousands of men are facing each other in the underground spaces.

Filters have been unsatisfactory. Water is sterilized by using 25 grains of sodium hypochlorite to each 100-gallon metal tank in which water is carried around on wheels.

The trenches are infested by swarms of flies, in spite of all that can be done; hence the typhoid and paratyphoid. Mosquitoes have not been a pest, though conditions have been favorable for propagation.

[Progress of War. Editorial comment in the *Naval Medical Bulletin*. *Army & Navy Register*, Apr 1, '16. 3500 words.]

(The comment covers phases "worthy of attention from the naval medical officers' viewpoint." Some points are of interest from a military standpoint as well.—Ed.)

The hospital transport service was entirely inadequate in the early stages of the war, and again at Gallipoli. The latter was due to the absence of any accommodations for the sick and wounded ashore.

Perfection of transportation, such as hospital trains and motor ambulances, assists greatly in the care of the wounded, particularly with stationary lines and good roads. Infection has been abundant, and established methods of treatment have not been materially altered. Little new in the way of antiseptics has developed. "Shell shock," serious disturbance of various kinds without any actual wounds, has attracted much attention. Treatment is to provide new environment.

No satisfactory mask against asphyxiating gases has yet been devised. Prophylactic inoculation has robbed typhoid of its terrors. Typhus infection is now understood and the disease can be controlled. In Germany, plants capable of handling as many as 12,000 to 15,000 men a day, have been organized for eradication of body lice.

The present ratio of dead to total injured is about 1:3.2 for military operations. The scope of medico-military matters of interest covers a wide range of topics such as hygiene and sanitation of prison camps, trenches, lines of communication, concentration camps, water supply, laundering and disinfecting facilities, etc. Volumes will be written on these and many kindred subjects; meanwhile, reports from the front are of inestimable value.

[Hospital Lessons of the War. Editorial *Modern Hospital*, Apr, '16. 2000 words.]

The report of Surgeon A. M. Fauntleroy, U. S. Navy, on "Medico-Military Aspects of the European War," is an epoch-making document. Wars have been prolific in medical and surgical advances. The Crimean War brings to mind the work of Florence Nightingale in the care of the sick. The American Civil War brought new surgical and medical methods and procedure, new ideals of the care of the sick.

Among improvements mentioned, the Russo-Japanese War marked notable advances in surgery, care of infections, and transportation of the sick and wounded. Since the last war of consequence, certain advances have been made, such as typhoid vaccination and the prevention of typhus.

No satisfactory information concerning changes and improvements in medical and surgical practice has come, and we were led

to believe that none would come. But now we have Dr. Fauntleroy's report, a volume of only 150 pages, a large part of which is made up of illustrations, showing transport, hospital equipment, splints and dressings, etc.

The *Modern Hospital* intends to publish an epitome of the report in three numbers. The first part is published in the current (April) number, concerns new splints, new apparatus, new dressings, and new methods of treatment of the wounded. The May number will contain the second part, concerning the methods of transporting the sick and wounded to the base. The third part, covering hospital equipment, will be published in the June number.

Modern methods have appeared to be growing hopelessly complicated, but we now have evidence of how little material and how little apparatus and how little housing are needed for the care of the vast armies with a degree of efficiency never before attained.

See also

AUSTRALIA—EXPEDITIONARY FORCE FOR  
EUROPEAN WAR—SANITARY SERVICE  
FRANCE—ARMY—SANITARY SERVICE

France

[American Red Cross Ambulance Service in France. By Neal Truslow. *Scientific American*, Oct 7, '16. 2500 words. Illustrated.]

(A narrative from the personal experiences of the author who has just returned from France after a year in the American Red Cross ambulance, and having been awarded the Croix de Guerre for bravery in picking up the wounded at Verdun.)

A trip to the front near the Mort-homme is described. As the area of bombardment was reached, all lights were put out and the distance between cars increased to 200 yards. But slow progress could be made over the damaged and shell pitted roads.

Rescue work by the field doctor and the stretcher-bearers can only be undertaken at night. Until then the wounded must take care of themselves. The first medical attention is an anti-tetanus hypodermic. Next there is a hurried binding of serious wounds. Minor injuries are not touched. The wounded are sent to the dressing station a few hundred yards back of the line. The dressing station is usually in a cellar and as well protected as possible. Here the surgeons work rapidly. The urgent cases are cared for first, Germans and French alike. Trepanning and amputations are the only surgical operations performed. Then the movement of wounded by the ambulance service begins.

The best type of motor ambulance has a low body and carries five stretchers which slide in grooves in the side of the car and in a central partition. This partition is removable and converts the ambulance into a light truck for medical supplies, gas masks, etc.

The wounded suffer considerably from rough hauling. It is a question whether to go slowly and carefully or rapidly and more roughly.

A motor ambulance section should contain only one make of car. The cars should have

**EUROPEAN WAR—Continued**

10 or 12 inches clearance for this work.

The light cars have proven unsatisfactory. They carry but three stretcher cases and there is constant evidence of lack of structural strength and motive power. A case is cited where four light cars worked all night to get out five wounded, a task that should have been performed by one good car in an hour.

**Great Britain**

[Military Hospital Arrangements in Great Britain. By a Retired Army Officer. *Modern Hospital*, Nov, '15. 2000 words. One illustration.]

School buildings have been extensively used for hospital purposes as an emergency measure, in May, 1915, amounting to as many as 250 buildings. This involved ousting 130,000 children, all but 6000 of whom were provided for by utilizing other buildings with morning attendance for one set of children and afternoon attendance for another. This scheme has the disadvantages of expense in adapting the school buildings to hospital purposes and disorganization of the educational system. Latterly, the tendency has been toward the erection of temporary structures of minimum cost. Private houses and public institutions have also been used, but this practice is being discontinued. Two private houses have been used as special hospitals for officers suffering from battle shock.

The British and German governments have agreed upon a square diagonally divided into black and white segments as a distinguishing mark for hospitals, churches and museums as a protection against damage by aircraft.

Basement and first floor windows are ordered closed when bombs emitting poisonous gases are dropped in the vicinity of hospitals.

Two hospitals have been established near Boulogne for the Indian contingent. The medical staff consists of officers of the R. A. M. C. and European orderlies and ward-masters, and such native attendants as caste restrictions require.

Generous assistance has been rendered by Canada in providing hospital service. Four hospitals have been so provided, one of them having a capacity of 3000 patients. Other contributions of supplies and personnel have been made by Canada.

A great variety of buildings have been utilized for hospital purposes in France, with consequent difficulties in administration. At present, the main hospitals abroad are in the neighborhood of Rouen and Boulogne. There is a very large base hospital at Rouen, where every kind of building has been utilized and auxiliaries constructed with boarded floors, double roofs, and every convenience.

Based on experience, the best arrangement for medical administration of the line of communications has been found to be to use the British military hospitals in France as "clearing stations." All cases are sent to England for treatment unless they are likely to be ready for duty in three weeks, or the cases are too grave to stand transportation.

The officer in charge of the hospital requisitions twice daily for transportation for patients, specifying those for transfer to convalescent depot, those requiring and fit for passage to England, and those for transfer to a more distant base.

In many respects, the medical service differs widely from previous experience, the most important development being in the wide use of the motor car. This has had an important influence on field medical organizations. A motor ambulance convoy consists of 50 ambulances, a repair van, two or three supply lorries, two motor cycles, and a car for the officer commanding. The staff consists of the R. A. M. C. major in command, three R. A. M. C. assistants, a quartermaster, three motor transport officers (Army Service Corps), and a driver and orderly for each car. Each convoy evacuates the sick and wounded of two divisions from the front to the clearing hospital and thence to the ambulance trains. An immense number of motor vehicles and the magnificent roads of France greatly simplify the problem of the rapid removal of the wounded from the front. About 70% of the field ambulance transport now consists of motor vehicles.

What were formerly known as "clearing hospitals" are now called "casualty clearing stations." They are mobile units, though the army now has little mobility. To these points the wounded are brought, generally in the early part of the day. Cases are examined and classified. Attention is given to cases requiring it immediately. The serious cases requiring immediate operation are detained, and the remainder (70% to 80% of each convoy) are transferred to the hospital train and thence to the base with the utmost expedition.

The hospital trains are the latest development of railway accommodation for the wounded. They are complete hospitals on wheels. The Princess Christian hospital train is an example. It accommodates 400 patients, 174 in cots and 226 sitting up. Separate wards are provided for infectious cases. The cars are loaded from the ends and unloaded from doors in the center. They are heated by steam, and lighted by gas and electricity. Sleeping accommodations are provided for the staff. Kitchen, operating room, office, and store rooms make the train complete in every respect.

[The English Sanitary Service in the Great War. Translated from the (London) *Times History of the War. La Guerra y su Preparación*, May, '16. 16,000 words.]

**—Staff Questions**

[Wasting the Staff. Editorial. *Army and Navy Gazette*, Jan 22, '16. 500 words.]

There is a general feeling that some of the general staff officers with organizations maturing for the front should either be dispensed with for economy, or else sent to the front where they could be gaining valuable experience. Three general staff officers are needed for each division at the front, but not

on home service. It will be urged that the general staff officers should be thoroughly familiar with the units when they go to the front, but it could easily be arranged for them to be on duty with their divisions for a sufficient time to permit this and still be utilized for some other service for a portion of the time the divisions spend in training. They could be temporarily loaned to divisions short-handed in France, or spend their time studying conditions at the front.

#### Submarines in

[The German Surrender. By Arthur Pollen. *Land and Water*, May 11, '16. 3400 words.]

(The American note to Germany of Apr 20th and the reply to the same with the probable effect on submarine operations is discussed.)

We should be foolish if we relied on the reprieve which Mr. Wilson's diplomacy has secured and excused ourselves from further effort either to destroy German submarines or replace the ships they have sunk. The campaign of March and April undoubtedly exhibited the high water mark of what submarine attack could do. It is by no means obvious that we have reached the high water mark of what our ship builders can do. Ship-building has been made war work and the Admiralty has removed all difficulties from the way of building merchant tonnage, but it would seem more logical for the government itself to undertake this construction. It is our own government, and not the Germans, who have brought our available merchant tonnage low. Of all forms of naval shortsightedness, the strangest surely was the abstraction of half our merchant ships for naval and military purposes without the immediate taking in hand of building an equal tonnage to replace what had been abstracted. It is not too late for this change to be made now. The internal condition of Germany may, at any moment, make the position of the Emperor desperate. When this happens, no fear of America will stand in the way of more furious assaults than ever.

The astonishing discovery has been made that light cruisers are the best defenses against the air raids of the enemy. The anti-aircraft guns that protect our towns are immobile. They can only fire when the airship comes within range, so that in any event the time available for finding and correcting the range is exceedingly short—a grave disadvantage. Next, the airships only come over the land in darkness. However good the searchlights, a Zeppelin artificially illumined at a great height is a far more difficult mark than one seen in the broad light of day. The naval guns have the great advantage that they are carried in ships that can go 30 knots. Supposing a Zeppelin comes straight over a shore gun at a height of 9000 feet, and assume the gun to have an effective range of 4000 yards, the Zeppelin could be kept under fire while approaching and departing for about three minutes if its speed were 60 miles an hour. But if the gun had a speed of 30 miles an

hour, the danger period for the Zeppelin would be increased from three minutes to over five. But if a Zeppelin instead of coming straight over a fixed gun, went 3000 yards to the right or left, the gun would not be able to reach it at all, whereas in a similar case a 30 knot ship could bring it under fire. Every British cruiser and destroyer carrying a gun for vertical fire and cruising in the North Sea is a highly mobile, and as the Germans now know, a highly dangerous obstacle. It is a pleasure to know that the Navy has added a new terror to the seas over which the raiders must pass.

See also

SUBMARINES—USE OF IN EUROPEAN WAR

#### —Supply and Transport in

See

SUPPLY AND TRANSPORT—IN EUROPEAN WAR.

#### —Territorial Changes

[Areas Taken by the Germans. *Arms and the Man*, Nov 25, '15.]

A German estimate of the physical results of the first year of the European war was received in the latter part of September of this year by the Bureau of Foreign and Domestic Commerce, embodied in a report from the American Association of Commerce and Trade of Berlin, which said, in part:

"It is of interest, at the close of the first war year, to record the amount of hostile territory occupied by the belligerents. In regard to prisoners taken only German data are available. The territory occupied by the Allies consists of: In Galicia, 3861 square miles; in Alsace-Lorraine, 405 square miles; a total of 4266 square miles. This territory is about the size of the State of Connecticut.

The territory occupied by the central powers consists of: In Belgium, 11,197 square miles; in France, 8107 square miles; in Russia, 50,197 square miles; a total of 69,502 square miles. This territory is about the size of the State of Missouri and about one-third the size of the German Empire."

#### —Topography of

See also

ARCHANGEL

FRANCE—MILITARY TOPOGRAPHY

SALONIKI—TOPOGRAPHY

#### —Wounded—Duty for

[The War in Europe. *Army & Navy Jour.*, Nov 27, '15. 50 words.]

80,000 men have been gained for the French army by substituting disabled men for men fit for service occupying easy positions, according to a reported statement of Gen. Gallieni.

#### —Wounded

See also

WOUNDED—INSTRUCTION AND TRAINING OF WOUNDED—WORK FOR

#### EXPLOSIVES

[Several Modern Military Explosives. By Otto Myrin. *Kustartilleri Tidskrift*, part 4, '15. 2900 words.]

It is due to modern chemistry that the benzol components of coal tar are now used

**EXPLOSIVES—Continued**

not only for the production of coloring dye matters and many medical supplies, but also for some of the most important military explosives, either alone or in combination with other substances.

It is true that nitrocellulose powders are yet used to a great extent, but that is mainly due to the difficulty of obtaining a sufficient quantity of the coal tar derivatives.

That the nitrocellulose powders are in most respects inferior to the modern nitrobenzol derivatives is not disputed. Take for example the matter of stability. While the nitrobenzol explosives can be kept almost indefinitely without change, the nitrocellulose powders deteriorate, especially when kept in a warm place, and soon become dangerous.

The oldest of these explosives is *picric acid*. As far back as 1873 H. Sprengel demonstrated its explosive character and after Mr. Turpin, in 1885, had shown that picric acid, by itself, could be melted and poured into a shell or other receptacle and, by its lack of sensitiveness, was very suitable as an explosive in projectiles, it became very generally used as a military explosive. Other nitro-substances were added to it for the purpose of reducing the melting point and there resulted *melinite*, *lyddite*, *perite*, *shimose*, *picrinite*, *ecrasite*, etc.

The objection to picric acid alone is that being slightly acid it attacks metals that it comes in contact with, forming picrates which are much more sensitive to shock, and hence dangerous to handle, therefore it is no longer used alone.

The explosive most used at present is *trinitrotoluol*, which is a very stable substance, not affected by heat up to 130° C. When used in shells or mine cases part of it is melted and poured in, while the core is not melted but pressed in to facilitate detonation, since the melted portion does not detonate as readily as that which has not been melted. It does not act upon other substances, and hence is perfectly stable, and is also very insensitive to shock, therefore very suitable as an explosive for shells. In addition to this the toxic effects are very great as owing to the production of a large amount of carbon monoxide the gases produced are very poisonous in a closed space. Quite lately a new explosive has been introduced, but only to load mines with as it is more sensitive to shock than the above mentioned explosive. It is *hexa-nitrodiphenylamin*, a yellow powder, the serious objection to it is that it not only discolors the skin, but also produces painful and lasting eruptions on the hands and arms if any of it comes in contact with them.

Another lately discovered explosive is *hexa-nitro-diphenylsulphide*, patented by Carbonit in Hamburg. This is a stable compound and its gases contain besides the poisonous carbon monoxide sulphur acids in large quantities which make an explosion in a closed room very deadly.

Another similar explosive is *hexa-nitro-*

*sulpha-bensid*, but this is more expensive, and hence not so apt to be used.

Still another of this type has been proposed—namely, *hexa-nitrodiphenyloxide*, which is claimed to excel picric acid in explosive power.

In the experimental state another type of explosives is being tried in Germany—namely, the highly nitrated "*alifatiska*" (?) carbonates.

[Influence of Low Temperatures on Explosives. Abstract from *Le Génie Civil. Memorial de Artillerie*. Mar, '16. 350 words.]

Kling and Florentine have performed a series of experiments with the object of investigating the effect produced on explosives by artificial cooling. The experiments were conducted with detonating explosives (fulminate of mercury and picric acid) and with mining explosives (dynamite, Favier powder and cheddite). They operated at temperatures varying from ordinary temperature to -190°. To obtain the latter liquid nitrogen, carbonic acid snow and acetone were used as refrigerating substances.

The following conclusions were drawn:  
1° The sensitiveness of the explosives to the action of fulminate of mercury fuzes diminishes considerably at low temperatures.

2° The velocity of propagation of the explosive wave is scarcely affected by the cooling.

3° The force of the explosion, measured by the method of Tranzl, is not sensibly diminished by the cooling as long as the detonator used is powerful enough to insure complete deflagration of the charge. It should be noted, however, that a cold detonator, although it appears not to have lost much force, has lost the power of initiating deflagration in an insensitive explosive such as picric acid.

4° At the temperature of carbonic acid snow (-80° approximately) the influence of cold gives results of the same order as the above, but much less marked.

The observed phenomena may be attributed to two causes: In the first place, the decrease in temperature perhaps produces modifications in the physical state of the explosive which makes it less apt to detonate under the influence of the explosive wave. The latter may also be modified by the cooling of the detonator. On the other hand, the difference between the initial temperature (some 190° below zero) and the temperature of combustion of the explosive is so great that the quantity of heat given out by the detonator may be insufficient to raise the surrounding layers of explosive to the minimum temperature below which detonation is impossible.

[Roburite and Ammonal, Ld. *Arms and Explosives*, Sept 1, '16. 700 words.]

At the annual meeting of the Roburite and Ammonal, Ld., was discussed the important part which the company had taken in the production of war explosives. Mr. A. H. Krohn, who presided, said at an early stage of the conflict, the developments in the charac-



ter and operations of the war led to such an enormous consumption of propellants, especially of high explosives, that the requirements of the British Government, both for itself and for its allies, quickly reached figures which a short while before would have seemed fabulous. The government erected factories of its own on a very large scale, but would never have been able to cope with the ever-increasing demands without the co-operation and assistance of the explosives trade. The Roburite and Ammonal Company had been able to take an important part in this good work, because it had acquired, a few years previously, the rights of a very powerful military explosive, had perfected its manufacture and had laid out its factory in such a manner as to facilitate a very great and rapid extension of output.

Ammonal, when first introduced into England, had a high military reputation on the Continent, but the British military authorities would have nothing to do with it, so that at the outbreak of the war it was practically unknown to the army at large. Mr. Krohn said that the war had changed all that, and that the name of Ammonal had become a very familiar word in the mouth of the British soldier.

See also

AMMUNITION  
COTTON—AS A SOURCE OF EXPLOSIVES  
DEMOLITIONS  
KAUSOLIT  
POWDER  
TETRANITROANILINE

#### FAR EASTERN QUESTION

[The Russo-Japanese Understanding and the Chinese Question. By Fernand Farjanel. *Revue des Deux Mondes*, Dec 15, '15. 12,000 words.]

In consequence of the war in Europe, the political aspect of the Far East is changing, the relative positions of the foreign powers are shifting, old questions are reappearing; the number of powers involved, and the complication of their interests, have turned the situation into a veritable labyrinth.

The relations of Japan and Russia until comparatively lately have been sometimes latently, at other times openly, hostile. Forced to seek an exit for its growing population, Japan cast envious eyes on the nearest country, Korea. As early as 1876 she had got a foothold in this country and had compelled the signing of a treaty to her advantage. On its part, Russia having no free issue to the sea in Europe, was seeking one in Asia. Obviously Vladivostok, frozen in annually from December to April, could not meet her wants. Russian statesmen therefore were continually turning southward, toward the Korean coasts, toward Southern Manchuria, on the shores of the Gulf of Pe-chi-li, and even toward China itself. They were awaiting the moment when the decadent and helpless Chinese monarchy gradually allowing the country in which it lived as a parasite, to fall into decay, should allow some division of the spoils.

The war of 1894-95 put an end to these ex-

pectations. The Treaty of Shimonoseki gave to victorious Japan not merely freedom of action in Korea but also the Liao-tung Peninsula, with its harbor of Port Arthur, valuable as a naval base. But the possession of such a base by Japan naturally caused anxiety in Russia, anxiety that bore fruit in the declaration to Japan by Russia, Germany and France that she was, in the name of the principle of the integrity of China, to give up the fruits of victory. Japan, unable to oppose so formidable a coalition, accordingly abandoned Port Arthur, and consoled herself as best she could with Formosa, and with the pursuit of her policy in Korea. Count Inouye endeavored at first to establish an intelligent and flexible protectorate over Korea, but he was compelled to give way to a brutal and stupid general. A month after his arrival, the Queen of Korea was murdered, and a revolution set afoot whose purpose was frankly to put the King completely in the power of the Japanese. The King sought safety in the Russian legation at Seoul.

Such a state of affairs obviously could not fail to produce tension between Japan and Russia. This tension grew in the years immediately following, with every advantage that Russia succeeded in obtaining from sickly China. In 1896, for example, she ceded to Russia the right to exploit and guard the Trans-Manchuria railway; this was tantamount to tracing a sort of Muscovite frontier around the growing Japanese sphere of influence. Hard as this was to bear, it was as nothing to the lease in 1898 by Russia of Liao-tung Peninsula with its famous port. Later the Russians obtained a part of Manchuria; and finally the appointment in 1903, of Admiral Alexieff as viceroy, seemed to indicate beyond all doubt that Russia was definitely going to oppose Japan on the continent of Asia and take unto herself the hegemony of the Far East. The Japanese resort to these efforts, aggravated as the whole matter was by Russian chicanery, was the war that ended at Mukden with the defeat of the European Colossus. This war did more than overcome Russia; it opened the eyes of the world to a spirit of method, to a foresight and a constancy of purpose well worthy of envy; it marked the awakening of the yellow race, it proved that this race could hold its own with the white. The whole of Asia in the Far East glowed with pride, and felt that a new era was opening for it.

Russia withdrew from the contest to heal her wounds, and left the field to Japan, who installed herself at Port Arthur, developed Dalny (Dai-ren) and continued her policy in Korea. That country is now Japanese territory pure and simple.

As Russia appeared to have renounced her ancient plans in respect of Manchuria, relations between the two countries improved. Conflicts and dissensions there were, of course, but the two governments saw to it that they never became public questions. And, in fact, there was other business before them, to meet the competition of the other great powers. For

### FAR EASTERN QUESTION—Continued

in spite of the results of the war, the political interests of Russia and Japan in the Far East had remained unchanged, viz., the necessity of each to expand. It is fair to assume therefore that neither had really renounced her future plans and that they were both merely waiting until events should so shape themselves as to favor their designs by modifying the equilibrium of their forces, and the general situation. This waiting game was logical: how else could either extend her sway over the Asiatic continent, in the face of the imposing forces whose flags had already appeared in China? For in this grave question of hegemony, Germans, Englishmen, Frenchmen, Americans, and even Italians and Portuguese were directly interested.

France had for several centuries held an excellent position in China; moreover, as owner of Tonkin, she had the right to be heard in matters relating to influence; England, Germany, America, all considered China as a sort of reserved territory whose advantages should be turned to the advantage of the white race. Should these advantages be allowed to accrue to one and to only one power? Evidently not.

The first project was to divide territory and population. From this fate China was saved by the jealousies and rivalries of the various competitors; there followed the principle of the integrity of China, with the system of spheres of influence. But this system itself was very imperfect. Hence, without abandoning the idea of spheres of influence, there came into being the famous *consortium* under which the powers representing the greatest capitals were to group themselves and take up the economic and administrative reorganization of China. In fact, this system was adopted by England, France, Germany and the United States, represented by their bankers and diplomats. Russia and Japan, not being financial nations, remained outside of the group. But knowing China as they did, they realized the fallacy of omitting from the account 450,000,000 Chinese as having no interest in the matter. As a matter of fact, the dynasty was growing day by day more unpopular; it was accused of selling the country and its resources. The popular irritation culminated in the revolution of Oct, 1911; in a few months the empire was overthrown, and a republic declared. With this new government the *consortium* at once opened negotiations. But Russia and Japan had no idea of being left out: while the *consortium* was negotiating they were acting. On no account would they consent to a policy that meant nothing more nor less than the control of all China.

About this time Yuan Shi-kai appeared upon the scene. Ambitious of the supreme power, his scheme was not only to prevent the support of the republicans by foreign capital, but to obtain this support for himself. In this he was seconded by Russian diplomacy, hostile to any republic in China. The *consortium*, therefore, soon found itself compelled to admit Japan and Russia, and decided to pin its hopes on Yuan Shi-kai. The republicans

of the south thus were, so to say, ousted from any part in the direction of affairs. Yuan was president, and the assembly was transferred to Peking, where its power became nil.

The difficulties of the *consortium* had now so greatly increased that it abandoned its ambitious plans of the past in favor of a course intended to keep the country from going to wreck and bankruptcy as its obligations fell due. It was moreover important to preserve China's credit on the foreign exchange, a credit menaced by news of revolutions, sedition, anarchy, tempered from time to time by the judicious assassination of important republicans. Yuan took advantage of this situation to borrow money from the *consortium* in order to pave the way for the *coup d'état* that he was preparing, by declaring that he was helpless to put down anarchy without funds. He thus managed to borrow 630,000,000 francs.

The President of the United States, Mr. Wilson, now took a hand in the game. Realizing that the republic was riding for a fall, and unwilling that the States should have any share in the business, he ordered the American bankers to withdraw from the group. Here a division marks itself: Russia carrying with it Germany, France and England, was outspoken in favor of a dictatorship, but Japan could not forget that Yuan was an old enemy. It supported the republicans, and in so doing assumed a dual character, for it still kept its seat in the *consortium*. And we have thus the paradox of a government by divine right protecting republicans, while the liberal Western powers, whose principles these very republicans were trying to establish, were giving all their assistance to the opponent of these principles. But the Japanese, understanding China far better than any Europeans whatever, realized that Yuan, incapable as he was to govern and administer save by the methods of the empire, would become as impotent as this had proved itself to be, and so would be merely a docile instrument in the hands of the foreigners.

Such was the state of affairs when the war of 1914 gave Japan its opportunity to act with energy. It drove the Germans out of Tsingtao. And then the question arose in Japan: "Shall this position be restored, not so much to China, as to the former adversary of Japan?" Public opinion in Nippon was squarely in favor of retention: so was official opinion. But the powers necessarily were on the opposite side. The defeat of the Germans in Shan-tung furnished an excellent opportunity of re-establishing the principle of the "integrity of China"; evidently, however, no decision could be reached while the war lasted. It is clear though that the Island statesmen had fully made up their minds to take advantage of circumstances in order to push forward their plans of expansion on the continent, and especially to develop the economical and political penetration of the country. Here they were to meet the resistance of all the powers, except Russia.

Yuan now saw his opportunity. Seeing

Europe absorbed in a distant and colossal conflict, he turned to Japan, and opened secret negotiations with that country. Precisely what these negotiations amounted to, no one knows, but the fact remains that an acceptance by Yuan of the Japanese conditions in their entirety meant destruction. An indiscretion, in Jan, 1915, revealed these demands, and at once caused anxiety on the part of all who have any interests to conserve in China. For Japan demanded practically everything: mining and railway concessions, in the north, center and south; certain rights at other points that would have permitted successful rivalry with the ablest competitors; and in particular, in the fifth group of its list, the appointment of counselors to the central government, to the provincial governments, to the general and local police, counselors who would be, in fact, veritable administrative agents. In substance this was a protectorate. It at once occurs to the imagination that this fifth group was introduced merely to be withdrawn if the remainder were granted: this withdrawal would create the impression that Yuan had saved the situation by forcing the abandonment of these exorbitant demands.

However this may be, the revelation produced a profound sensation both in China and abroad. The Chinese feared the loss of their independence; the foreigners, the decadence of their policy. Sir Edward Grey, accordingly, become the spokesman of the foreign powers, summoned Japan to take some account of the interests acquired in China by England, France, the United States, and other powers. Discussions followed, as a result of which Japan obtained the important economical advantages she had striven for, and withdrew, but only temporarily, her famous fifth group, that is her demand to establish a disguised protectorate.

As for Yuan, this fresh opposition between two adverse elements gave him the opportunity to practice anew the traditional pendulum policy of Peking. Carrying water on both shoulders, he had pleased Japan by promising an eventual support of her views, and at the same time has kept the support of the powers, from whom indeed in September of 1915 he succeeded in borrowing 12,000,000 francs just as though there were no war in Europe.

During the negotiations between Japan and Yuan, Russia had kept well in the background. As a matter of fact, since the outbreak of the war, she had drawn closer to Japan. The prospect of the opening of the Dardanelles contributed to this improvement of relationship, by making useless any future expansion in the distant Pacific. Both the Chinese and the Japanese press regarded an alliance between these two powers as probable. As, moreover, Russia was drawing munitions from Japan, it was to her interest not to intervene in the Chinese imbroglio, particularly as Japanese public opinion had become very nervous over the unwillingness of the powers to leave Japan a free hand. An armed intervention was even unofficially called for, and although nothing came of it, yet the Allies

suffered in consequence: shipments of arms and munitions to Russia ceased. The tension came quickly to an end, however; the skill of the Japanese government finished by being approved of the people. And as Russia, all other things equal, was no longer a future rival, attention was turned more and more to that country, and the supply of arms, etc., was resumed. But the powers did not come off so well: England particularly had excited animosity. And if she, an ally, refused to acquiesce in the advantages demanded by Japan, why not substitute Russia? The Russian markets would certainly be closed to Germany after her inevitable defeat; why not secure a good place in that market for Japan? If needed, even military assistance could be given. This question soon took on an air of actuality. As, however, all alliances are of the nature of contracts, what price would be demanded by Japan? Obviously, in the first place, the opportunity to stabilize results already obtained in China; in the next, to reach her goal, the actual control of the country, without let or hindrance from any other power.

Would the United States consent to this? Certain Japanese statesmen would be very glad, in order to oppose American views, to bring together various great powers. We must recognize in Japan three schools of thought. The conservative, still feudal and militaristic, sees in a Russian alliance a means of satisfying imperialistic aspirations by the acquisition of territory, by the elevation of militarism, and by resisting the United States. The Liberal, commercial and manufacturing element looks upon this alliance as the opening of a rich market, is not averse to a hostile policy against America, and favors territorial acquisitions in China. Finally, the democratic elements are looking for an alliance as a guarantee of peace in the Far East, and in consequence, for a reduction in the heavy burden of military expenditure. The first two so far have the better of it, with the feudal and military spirit dominant, and it is precisely this condition that makes so delicate every question of an alliance between Japan and one or more powers of the Entente, bound as these are to the States by ties of friendship and interest. Who will dominate in the Pacific? Will it be the United States, proud of its incredible industrial development? Or will it be the Empire of the Mikado, entrenched on the Asiatic continent, and controlling the immensities of China? For the time being, American views seem to be giving Japan but little concern. The marked pacifism displayed by the United States in its controversies with Germany has made a profound impression upon the Japanese, who seem to think that if any future question should become acute, the United States, profoundly attached to peace, would never go farther than juridical discussion, and that consequently all that Japan would have to do would be to throw her sword into the balance.

The hostility of the United States to any seizure by Japan of the direction of Chinese

**FAR EASTERN QUESTION—Continued**

affairs is the crux of the question. To-day the powers occupy precisely the same position as in the days of the empire. Either a new grouping, with Germany and Austria left out, must be attempted, or else each power must reserve full liberty to treat alone with Peking. The failure of joint action by the powers is due entirely to the fact that selfish motives were at the bottom of all projects and plans. Each element or member strove to impede or harass the others. The question now is the protection of interests acquired in China. Can Europe and America afford to allow that country to fall to pieces, and so bring on inevitably a foreign domination and thus awaken again the dangerous matter of division and rivalries? The condition of China is to-day what it was before the revolution, if it is not worse. Yuan's principles and methods are identical with those that existed under the empire, save that the religious prestige of the chief of the state has disappeared, and that consequently those generals in the provinces who can succeed in keeping their soldiers loyal to themselves have now become independent personages. The result is what we see to-day: a totally impotent administration, and latent anarchy in the provinces. The proclamation of a new empire under Yuan can have no effect: it is a word and nothing else, merely a new label. But nevertheless this word has had on the republican authors of the revolution an important effect, for they realize the value of forms in China. Hence a recrudescence of revolt, and of the terrorist agitation that shook the country during the last years of the empire, and contributed so powerfully to the revolution. Murder is resorted to as a political agency. The members of the various assemblies, provincial and others that have been suppressed, are continuing to plot and to conspire; the old societies hostile to the Manchu dynasty have resumed their destructive work. No confidence should be placed in the news sent out by the dictator himself: his purpose is merely to throw dust in the eyes of foreigners. In order to realize his ambitions, he has secured the adhesion of Germany, which has since the outbreak of the war exercised a great influence over the vernacular press. But the other powers refuse their approval of the plan to restore the empire. Mr. Wilson has informed Yuan that he may count on neither the sympathy nor the consent of the United States, Japan, Great Britain, Russia, France and Italy have announced that they are decidedly hostile to Yuan's elevation as emperor. These facts give a new aspect to the Chinese question without really changing its nature, for it depends on the interior situation of the country, now as always unfavorable to, and delicate in respect of, foreign interests. It has her contempt for and neglect of preparedness, been for years an apple of discord between the nations, for the reason that China, thanks to now finds herself unable to oppose foreign ambitions. It has been a cardinal principle of the powers to encourage China's weakness,

lest, if she wake up, she should prove a military menace. But this very encouragement contained the germ of a danger of a wholly different nature, in that it created opposing appetites liable to lead to conflict. Already the plan of dividing China has been abandoned: the thing is no longer possible, particularly as respect for nationality is one of the issues over which the Allies are warring in Europe.

Without foreign support, the present régime in China will fall to pieces. Then and only then will it be possible to resume the work begun during the first few days of the revolution, by the creation of provincial states joined into a federation resembling that of the United States. Thus organized, China would cease to be a "yellow peril," and, what is more, would rise from the inferior and humiliating situation in which she now finds herself. This solution is not chimerical; on the contrary, it has been the program of all educated Chinese. Once achieved, this renaissance of China would free international politics of a question that bids fair to be as dangerous as that of the Balkans.

**FEET****—Care of the**

[The Care of the Feet, from *The Western Scot*, in *The Canadian Military Gazette*, Jan. '16. With references to official bulletin, N. Y. Police Dept. 600 words.]

When an army is being constantly recruited from among men who have always led strictly civilian lives more attention than ever should be given to the care of the feet. The entire weight of the body is borne by the arches of the feet which have three points of support—the heels and the balls of the great and little toes. If the feet are not planted so that all of these points of support are brought into play a correspondingly greater strain is put on two of them with the result that the foot tends to become flat.

The common causes of flat foot are faulty walking and standing, and poor shoes. The remedy for the first two is obvious. A good shoe will allow freedom to all the toes, particularly the great ones, will allow the foot to move freely in all directions and will hold the heel and instep snugly but without cramping. One with a flexible arch is desirable. The proper shoe once selected, great care should be taken to give it the natural shape of the foot.

Proper socks are next in importance to proper shoes. They must not be too snug, large or too thick. A medium weight of wool and cotton is best. A fresh pair should be used each day and the feet must be washed daily in cold water using but little soap.

See also

"TRENCH-FOOT"

**FENCING****—Bayonet**

See also

BAYONET—INSTRUCTION AND TRAINING

**FIELD ARTILLERY**

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[Notes from a Line Officer's Note Book. By 1st Lt. R. C. Burleson, 3d F. A. *Field Artillery Jour.*, Oct-Dec, '15. 700 words.]

These are miscellaneous notes of a few things observed in camp. An improvised fireless cooker is described. A hint is given to the infantry that the glint of the butts of the rifles discloses their position on the march. A hint is also given how No. 3, who sets the fuse setter, may speed up without sacrificing accuracy. Two methods are given for loading balky horses on cars.

See also

ANTI-AIRCRAFT ARTILLERY

FORTIFICATIONS—FIELD—FOR ARTILLERY

Sweden

[The Swedish Field Artillery, Organization and Matériel. By 1st Lieut. O. C. A. Jacobs. *Dansk Artilleri Tidsskrift*, Mar, '16. 3000 words.]

With the introduction of the 10.5 cm. field howitzer, model 1910, the Swedish field artillery is now quite modern, both with respect to organization and matériel. The siege artillery regiment was modernized several years ago by the introduction of a 15 cm. mobile howitzer, model 1906.

The field artillery consists of six regiments, one being assigned to each of the army divisions. There is also a field artillery battalion on the island of Gottland, which consists of two field and one howitzer batteries. Each of the six regiments of mobile artillery has three battalions of field guns and one battalion of field howitzers. The field gun battalion has three batteries of four guns each, the howitzer battalion has two batteries of four guns each. In addition to the above there is one additional battalion of horse artillery attached to the third artillery regiment, which at mobilization is assigned to the independent cavalry division in southern Sweden. This gives 57 gun batteries, of which three are horse batteries and 12 howitzer batteries, or a total of 72 batteries, including those on Gottland.

Sweden has 3.7 guns (howitzer included) to every 1000 rifles in her mobile army (division), France and Germany 5, Italy 4, Russia 3, the United States 2.8 and Denmark 2.6.

The regimental staff and detachment is comparatively large, consisting of 10 officers, 33 n. c. o. and men with three 2-horse wagons and 38 mounts. One noticeable feature is a large signal detachment, consisting of six mounted men and a cycle orderly.

The battalion staff and detachment comprises three officers, 23 n. c. o. and men, and 31 horses as well as a train of one 6-horse tool wagon and one 4-horse baggage wagon. Included herein is a range-finding squad of three men, a signal squad of four men and one cycle orderly.

The battery organization, both field and howitzer, is similar to that in most armies, there being six caissons in the firing battery and a combat train with four caissons. Although the horse battery has no combat train, there is a light train with the horse artillery battalion which contains nine caissons. The

**FIELD ARTILLERY—Continued**

field battery baggage train has three 4-horse wagons, the horse and howitzer batteries both have four 4-horse wagons. The field battery has four officers and 139 men; 71 mounted and 68 not mounted; the horse battery three officers and 113 men (nine not mounted), and the 10.5 howitzer battery four officers, 77 mounted men and 71 not mounted.

The reason for the large regimental staff and detachment is undoubtedly on account of the regiment having four battalions, and also because the regimental commander acts as chief of artillery for the division. The strength of the personnel of the battery is on the other hand comparatively small, and if a comparison is made with the French it is seen that the proportion between personnel of staff and battery is there about 1 to 10, whereas in Sweden it is about 1 to 3.

In the division ammunition train we find the following: 24 six-horse wagons with 75 mm. ammunition and 16 with 105 mm. ammunition. With the cavalry division there is a light ammunition train with nine caissons and a heavy train with 12 caissons of 75 mm. ammunition. The total number of rounds per gun of 75 mm. ammunition is 414, divided between the firing battery 188, combat train 96, and division ammunition train 130. The corresponding figures for 105 mm. ammunition are 273 (99+54+120). There are about 250 rounds per gun in the reserve ammunition column. Both gun and howitzer use shell and shrapnel, the bursting charge of the former being 140 grams of picric acid for the 75 mm. gun, and 155 grams of toluol for the 105 mm. howitzer.

The 75 mm. field gun is the Krupp Model 1902. The 105 mm. Model 1910 field howitzer is a thoroughly modern weapon, and is made throughout by Bofors. It fires a 14 kg. projectile, and five different weights of propelling charge are used with muzzle velocities of from 306 to 160 meters per second. Recoil is automatically controlled in elevation, being 1100 mm. at 0° and 500 mm. at 43°. The gun has a traverse of 2.5° each way on its carriage.

**United States**

See also

**FIELD ARTILLERY—MOTOR TRANSPORT**  
(Article: "A Motor Traction Regiment")

**—Adjustment of Fire**

[Correction of the Heights of Burst in Our Batteries of Field Artillery (continued). Germán Sanz Pelayo, Major, 6th Regiment Horse Artillery. *Mem. de Artill.* (Spain), June, '15. 1 figure, 9000 words.]

(A large portion of this installment is taken up with mathematical work which it is impracticable to abstract. The following rules for the correction of the height of burst are drawn:)

1° *One graze obtained in a salvo.* If this is accompanied by high bursts, the mean height of the latter is corrected to bring it to the normal; if accompanied by one high and two low bursts, the first is considered correct;

if lows predominate, the height is raised two mils.

2° *Two grazes obtained.* The height is raised four mils.

3° *Three grazes obtained.* The height is raised six mils.

4° *Four grazes obtained.* The height is raised eight mils.

**—Aeronautic**

[The Artillery and Aircraft. Lecture at the Artillery Club, Apr 28, '16. By Henning Schmitterlöw. *Svensk Artilleri-Tidskrift*, Parts 3 and 4, '16. 8000 words. 5 tables and 6 illustrations.]

1. *The assistance given to the artillery offensive by aircraft.*

The latest experience show that the extreme limits of the employment of artillery fire depend only on the range of the guns and the ability of the observer (aerial or otherwise) to observe the fall of the projectiles. During the period from 1870-1900, the artillery fired during peace practice at fully visible wooden or pasteboard figures which were pointed out to the batteries firing. But this method was gradually changed as it became necessary to conceal the guns from the view of the enemy, so that during the great army maneuvers in France in 1910 an observer (Col. Aubrat) could not discover more than 4 or 5 pieces, and these could then only be seen as they were firing. He, therefore, came to the conclusion (which he published) that in the future the location of an enemy's guns would only be ascertained by observing the direction from which their projectiles came, unless they could be located by an observer high up in the air, which he considered not always possible.

The French field artillery firing regulations of 1913 state that "the assistance of the aeroplane is necessary for the artillery in fire direction against hidden objects whose location is only discovered by their fire or by indefinite information."

The information as to the location of the object to be fired at is transmitted from the aeroplane observer either verbally on his return or by a report enclosed in a suitable receptacle which is thrown down to the battery that is to use the information, by visual or wireless signal, or by dropping smoke bombs when directly over the object.

For signalling from the air ship, a number of methods have been employed. The letting out of large and small clouds of smoke from a suitable container to spell out words by the Morse code, as was done at the siege of Namur by a Frenchman; movements of the aeroplane itself; by smoke bombs, rockets of several colors, flags, electric lamps, etc.; and, finally, by wireless telegraphy.

Valuable use has also been made of photography in locating the position of the enemy. As nearly as 1859 Napoleon III at Solferino had the position of the Austrians photographed from the air, but the development of this method was very slow and it was not until 1910 that three German camera makers, Nettel, Ica and Goerz put specially constructed balloon cameras on the market, one of which

after some improvements was adopted by the German Government in 1913. An Austrian officer designed a suitable panorama apparatus (Scheimpflug) for taking larger areas and combining them into a photographic map. Col. Uljanin, of the Russian Army, also designed a camera for this purpose in which the plates could be ready in 15-25 minutes after exposure. For observation of fire, the aeroplane is either above its own firing line or that of the enemy as may be practicable. In the latter case, it must be much higher in the air to avoid the enemy's projectiles, and also must be superior to his aeroplane force.

Since it has been found that during this war the artillery have often fired successfully at very long ranges, the author recommends that in peace practice firing be also held at the extreme ranges of the pieces employed, and points out that for this purpose the firing should be held at places where these long ranges can be safely laid out in several directions.

## 2. The defense of the artillery against aircraft.

The artillery must conduct its defense against aircraft partially by direct firing at it, and partially—perhaps principally—by entering into its own firing position in such a manner as to be covered from air spying.

For firing at aircraft, either specially designed anti-aircraft pieces are necessary, or in using ordinary field pieces special arrangements have to be made for the carriages to enable them to fire at objects in the air.

Among the requisites for such a piece may be cited:

1. The greatest possible lateral movement and elevation.
2. Great rapidity of fire, due to suitable recoil system, semi-automatic loading, etc.
3. Great initial velocity in order to obtain a flat trajectory.
4. Possibility of good hitting power to be attained by using suitable range finders, sighting instruments, etc. If a telescopic sight is used, it must be a panorama telescope with a large field of view.
5. Suitable ammunition. Explosive and time shell and shrapnel each with tracers, and also smoke shells.
6. Great mobility and readiness to fire. This can perhaps be attained by mounting the gun on an automobile, but here the weight (about 6 tons) may be objectionable, as it cannot be moved over some of our roads. Six methods of provisional mounting of anti-aircraft guns are illustrated.

As to the caliber of gun used during the present war, this has varied from 2 to 12 cm., and no agreement has been reached as to the best type, but the ones most used have been of the field gun caliber.

As to the location of the guns, it has been calculated that with a piece which has the ballistic properties of our field gun, to reach an object 2500 m. high the guns must be placed as near as 7000-8000 m. from each other; 3000 m. high, at a distance of 5000-6000 m.; and at 3500-4000 m. high, at a distance of 3000-

5000 m. The aiming is, of course, not directly at the object, but proper allowance must be made for its movement during the time of flight of the projectile. A barrage, or curtain, fire is also used, a stream of projectiles to some point thru which the aircraft is due to pass.

Before the war, a height of 1000 m. was considered safe from anti-aircraft projectiles, but now, owing to the more accurate fire of these pieces, it has been increased to 3500 m. The percentage of losses of aircraft due to firing from the ground is about 30 per cent. of the total.

3. *Cover against air-spying.* In column of march, artillery cannot avoid being discovered from the air during daylight. Movements should, therefore, be made, whenever possible, at night or in foggy weather. The formerly prescribed precautions of hiding the movements of troops by halts, taking cover, marching on the side of the roads, etc., are no longer effective in concealing them from the observation of aircraft.

When the artillery leaves its route to take up a position by daylight, it must be done as rapidly and secretly as possible so that its position may not be discovered. The position chosen should be, where practicable, on the edge of a wood, in a small grove, back of a house, in a garden, etc., and if in the open the guns should be placed at irregular intervals and be hidden by brushwood, trees, etc., put up over or near them.

If the guns are to remain in an exposed position some time they should also be protected from direct fire and bomb-proofs should be constructed for the ammunition. The painting of the guns and carriages of a color or in colors to render them invisible has also been resorted to with success. To hide the position of a real battery, resort has also been had to the construction of sham batteries to draw the fire of the enemy.

The artillery must be put in condition to take up the fight against aircraft successfully, and it must, by suitable modifications in its tactical dispositions, obtain shelter for itself from air spying.

[Notes on Artillery Aviation. By Lieut. G. N. Tricoche, late French artillery. *Field Artillery Jour.*, Apr-June, '16. 2000 words.]

In the early part of the war, the aerial service in France was very unsatisfactory and insufficient in numbers. Most artillerists were skeptical of the efficiency of aeroplanes in reconnaissance of targets and conduct of fire. The methods employed were too complicated. The possibility of using aeroplanes for long-range firing with large caliber ordnance was not even considered. This lesson was learned later on as is shown by the silencing of the heavy German guns firing at Dunkirk, due mostly to efficient air reconnaissance.

The present artillery aviations are mostly biplanes which are able to rise quickly and need very little space to land. These machines are not very effective when flying higher than 1500 ft., so special attention must be paid to protection against infantry

**FIELD ARTILLERY—Continued**

fire. Photography by aerial scouts is of little value for mobile artillery. The French soon abandoned their complicated method of signalling and copied the German method using rockets and smoke bombs. Most artillery avions are now provided with wireless.

Combat avions, supplied with high explosive bombs, have also operated in conjunction with batteries. They may be used in breaking up hostile counter attacks, to destroy communications, trains, stores, ammunition depots, etc. Since the beginning of the French warfare, the batteries have become stationary, and avions are now assigned to particular sectors in order to detect any changes in the hostile position, thus becoming thoroughly familiar with the battery and its sector.

Artillery avions are also accompanied by another class of avion called "Chase avion," which soar above the former and thus are ready to protect them in their legitimate artillery duties.

**—Ammunition—Allowance of**

[Ammunition of Horse Artillery Batteries. *Revista de Artilharia*, Dec, '15. Anon. 200 words.]

*Germany.*—According to the regulations each piece is provided with 247 rounds, of which 88 are carried in the caisson, 36 in the limber chest of the piece, 6 in the battery wagon, and 117 in the light ammunition column, consisting of 24 caissons, each carrying 88 rounds. Each group of 3 batteries, of 6 guns each, has a light ammunition column, which marches at the tail of the infantry, but which, in general, is about one hour in rear of its group.

*France.*—The French horse artillery is provided with 312 rounds per gun, of which the caissons of the firing battery and the combat train carry 288, and the limber chest of the gun 24 rounds. Each firing battery has 4 guns and 6 caissons; the combat train has 6 caissons, each carrying 96 rounds, and follows immediately in rear of its group or battalion.

[The Useful Effect of Explosives. By Don Antonio Parellada, Captain of Engineers, Spanish Army, *Memorial de Ingenieros*, Jan, '16. 11,000 words. Illustrations.]

An examination of the theoretical characteristics of an explosive permits only an approximate idea to be formed of its effects. In the first place this results from the uncertainty as to the true composition of the products of explosion, since these depend on an infinite number of circumstances, different in each case from all other cases.

It is not possible to determine the equation of decomposition at the high temperature of explosion; but supposing this equation known, and the pressure, the rapidity of explosion and the resulting temperature all known, in practice these factors combine, according to laws much more complex than generally supposed, and, as an actual fact, these laws are completely unknown.

Tests and experiments have a certain empirical character, due to the complexity of

the problem, but experience permits the foreknowledge and avoidance of many results not desired.

It is not possible to classify explosives in a general way, since results differ frequently in practice from those predicted. The pressure, the rapidity of development of pressure and the fractional part of the expansion that can be utilized in each case are all factors in calculating the useful work.

The decomposition of an explosive can be produced in two distinct ways: by combustion or by detonation. With the same explosive the products of explosion are usually different in the two cases; though detonation in the open air and combustion under high pressure usually give identical products.

If, in a system of co-ordinate axes,  $OX$ , the horizontal axis, represents the length of the bore of a piece and  $OY$  the powder pressure, we have the curve of pressure rising quickly and dropping slowly as the projectile travels toward the muzzle, when a quick burning, or degressive, powder is used; but with a slower burning, or progressive powder the maximum pressure occurs at a later moment, and then drops. This latter gives a greater useful result with less damage to the gun, and requires a smaller charge—the powder burning with increasing violence from the surface to the center of the grain. The useful work is represented by  $W = \frac{1}{2}mv^2$ , in which  $m$  is the mass of the projectile and  $v_0$  is the initial velocity. The maximum theoretical work that can be developed by a kilogram of the same powder is its potential energy, which may be designated by  $E$ . The effect

of  $C$  kilograms, then, will be  $W = \frac{W_a}{EC}$ , a

small value usually, since, in firearms, only a small fraction of the total expansion of the gases can be utilized. The longer the bore the greater the proportion of the expansion that can be utilized and the greater the initial velocity, although the powder is slow; and when the service conditions require the piece to be shortened, as in field guns, quicker burning powder is necessary.

The maximum theoretical pressure is calculated by the formula  $p = \frac{\Delta f}{1 - a\Delta} = \frac{8.8 a T \Delta}{1 - a\Delta}$ ,

in which  $\Delta$  represents the density of the charge,  $T$  the absolute temperature of the gases,  $a$  the absolute volume of the gases produced by one kilogramme of explosive, and  $f$  measure of the explosive force. This theoretical maximum is difficult to determine and to obtain, since the maximum resulting temperature of an explosion varies greatly, due to radiation and conductivity, the amount of which cannot be determined. Neither can the rapidity of decomposition be determined when the powder is confined.

Ignition by combustion is obtained either by heating the explosive or applying to it some ignited body. Ignition by detonation, however, produces a different decomposition. The shock, localized at one point of the mass,



sets up a compression and an elevation of temperature due to the increment of active forces received by the molecules directly struck. This initial increase of pressure and temperature favors the production of a volume of gas, and if the shock is sufficiently energetic the compression of the gases will produce a shock in the nearest molecules. Thus a wave is propagated throughout the mass. The velocity of the detonation increases with the density of the charge up to a certain limit; and, beyond that limit, as the density is increased, the velocity of the detonation decreases rapidly. This phenomenon, proved by a large number of experiments, explains the discrepancy between the theoretical results obtained by the formula of MM. Taffanel and Dantriche

$$Y = 6.41 \frac{f}{1 - a\Delta}$$

and those obtained practically by M. Dantriche. Besides, the energy of the fulminate exercises great influence over the velocity of the detonation. A weak fulminate acting on a dense charge diminishes the velocity of the wave, with resultant incomplete explosions which reduce the useful effect. (The author describes numerous practical experiments and compares the results with those deduced theoretically.—Ed.)

#### —Ammunition—Shrapnel

See

##### SHRAPNEL

#### —Ammunition—Shrapnel vs. H. E. Shell

[Note. *Army and Navy Jour.*, Jan 29, '16. 300 words.]

In "Medico-Military Aspects of the European War," Surgeon Fauntleroy states that recently at the unanimous request of French artillery officers, the manufacture of shrapnel was discontinued, high-explosive shell being superior for every use. The blast of the h. e. shell is effective against troops. The French "75" shell weighs 11.7 lbs.; bursting charge 29 oz.; propelling charge 22.5 oz.; i.v. 1920 f.p.s. The charge of the German 77 shell is only 5.5 oz. The Germans are developing a "unit" shell, i.e., one serving both purposes of shrapnel and shell.

#### —Ammunition—Supply Service

[The Ammunition Supply Service of the Field Artillery. From the French. Anonymous. *Artill. Monatshefte*, Sept-Oct, '15. 3500 words.]

Modern transportation facilities have somewhat simplified this service, but the stupendous size of modern field armies has introduced new difficulties. A deficiency in the food supplies as a rule involves fewer serious consequences than a deficiency in the ammunition supply, because the soldier always carries some ration with him and if necessary can go 24 hrs. without food, whereas if there is a deficiency in ammunition, in addition to the moral effect this will produce, troops must either retreat or discontinue the advance at the decisive moment.

The supply of ammunition for the infantry is not so uncertain as that for the Field Artillery,

for in addition to the 120 rounds carried on the person, the ammunition of the dead and wounded also becomes available. Whereas an ammunition wagon carries only 96 rounds for a light gun, it carries 36,000 rounds of small arms ammunition. Moreover the expenditure of small arms ammunition is not nearly so great as has been supposed.

Every war has brought forth new surprises; this is also true for the present war. All General Staffs were agreed as to the importance of field artillery, but were very much mistaken in their estimate of the probable expenditure of ammunition. The statistics from all wars of the past, even those of recent date, are of little value. For the French, their maximum average per gun per day was 138 rounds at St. Privat; for the Germans it was 194 at Vionville; in the Russo-Turkish War it was 180. In the Manchurian War, a daily average of 500 rounds per gun was expended in some cases. Not long ago Gen. Langlois demanded a reserve supply of 3000 rounds per gun. In 1911 Col. Buat expressed the opinion that the expenditure of artillery ammunition would be enormous in a modern battle, approximating for many batteries 500 rounds per day per gun. The present war shows this estimate to have been conservative. In the battle of the Marne, the average in some corps was 600 rounds per gun per day. To-day it is estimated that 1,200,000 rounds were fired in this battle. A recent official report states that 20,000 shell were fired against the positions at Carenay in the course of a few hours.

Before the war, the Germans had provided for an enormous ammunition supply, and in the beginning expended it lavishly because they had counted on defeating the French in a short campaign of three or four weeks.

The light artillery of a French Army Corps consists of 30 batteries, or 120 guns. On the road, a light artillery battalion marches in two parts, 3 firing batteries and the combat train. The firing battery consists of 4 guns and 6 ammunition wagons; the combat train of the remaining 6 ammunition wagons, the battery, store and forge wagons, etc. Each ammunition wagon carries 96 rounds, and the limbers of the gun carriage 24 rounds each, making 312 rounds per gun with the battalion. In action, the combat train and the limbers of the firing battery usually take a position under cover from 500 to 1000 yards in rear of the batteries. This combat train forms the general staff of the battalion. Its duties are to anticipate the changes in the situation, replacing all casualties in horses and men, and keeping the batteries supplied with ammunition and necessary parts of matériel so that the battery commander may devote all his time to the conduct of fire. Each gun has an ammunition wagon with it; these are kept filled from the two extra ammunition wagons with the firing battery. As the latter become empty, they are replaced or filled by ammunition wagons sent forward from the combat train. The ammunition wagons with the guns are never exchanged and the gun limbers are

**FIELD ARTILLERY—Continued**

never emptied in the fire position, but are used to fill the empty ammunition wagons in the combat train. The combat trains are supplied from the Corps Ammunition Park which is divided into three ammunition columns, carrying 189 rounds per gun in addition to the small arms ammunition for the infantry and machine guns. The nearest one of these columns approaches the battle field within about 4 or 5 km., the others being about 15 km. distant. The commander of the Corps Park does not await the orders of the batteries, but keeps in touch with their needs; he remains with the most advanced of his columns. The empty ammunition wagons of the combat trains are filled by one of the rear columns of the Corps Park, or by the columns of the Army Park. The Corps ammunition columns are replenished from the Artillery Army Park, which consists of as many columns as there are corps in the field army, and replenishes its ammunition directly from the factories through the railroads. This Artillery Army Park does not however control a great number of vehicles, and for this reason the Corps ammunition columns must frequently replenish from the distributing stations at the rail head.

To form an idea of the huge task of these ammunition and supply columns, let us assume a field army of three army corps or 150,000 men. Its artillery will fire in a two days' battle the total of 701 rounds per gun carried in the combat trains, the Corps Park, and the Artillery Army Park. To completely replenish this ammunition would require 252,360 rounds weighing 2,145,000 kg. Estimating the daily ration of the soldier as 1.8 kg., we see that the ammunition fired by 360 guns of a field army in two days weighs as much as the rations of 150,000 for eight days.

The ammunition supply service of the French Army has been remarkably successful, and a few changes in the regulations based upon field experience will make it even more so.

["Ammunition Up!" By William H. Parr. *Army & Navy News*, Aug. '16. 2000 words.]

(The author is a sergeant of artillery in the Canadian Expeditionary force, formerly in the Quartermaster Corps, U. S. Army. He gives a very vivid description of the difficulties and dangers of supplying ammunition to the guns at the front, the last haul being made always at night except under desperate need, and by horse-drawn vehicles.)

**France**

[Foreign Notes, France. More Regulations Concerning the Organization and Use of Artillery. *Mem. de Artill.*, (Spain), Apr. '15. 4000 words.]

(This outlines the provisions of the French Regulations, edition of Oct 1, 1913, with regard to the organization and use of artillery, especially with respect to the ammunition supply.)

**—Armories**

[Armory Plans for a National Guard Battery. By Lt. R. T. Olney, F. A., N. G. Mo.

*Field Artillery Jour.*, Jan-Mar, '16. 1000 words. Illus.]

The plans proposed include a set of quarters containing officers' rooms, non-com.'s room, club room for the men, and a locker room; a stable for 32 horses; a riding hall; and a storage shed for guns and carriages. The plans can be easily enlarged. The probable cost is \$30,000.

**—Ballistics**

[The Principles of Mechanics and Their Application. By Prof. Dr. Dziobek, Privy Counselor, Germany. *Artill. Monatshefte*, Sept-Oct, '15. 14,000 words.]

(Note.—The subject discussed is difficult of condensation. The author discusses the fundamental principles of mechanics and their application to the science of ordnance and gunnery, presenting in a popular form all the principles usually found in text books on the subject, so that a man with but a slight knowledge of elementary mathematics may understand the application of these principles.)

Lt. Gen. H. Rohne, in an introduction, states that in his long experience as instructor at the School of Fire for Field Artillery and at the War College, he has observed that the work of the instructor in the science of gunnery was frequently made difficult by the ignorance of his pupils of the simplest principles of mechanics. It was at his request that Dr. Dziobek wrote the article so that the ordinary field artilleryman may readily grasp the principles and their application.

[Recoil Brake Pressure. By Corp. J. F. Pelly, N. G., Pa. *Field Artillery Jour.*, Oct-Dec, '15. 2300 words.]

The subject discussed is difficult of condensation. The article is based upon the method outlined by Prof. Raussenberger in "Theory of the Recoil of Guns." But for the period of the after-effects of the powder gases when the projectile has left the muzzle, his assumptions with regard to pressure changes are incorrect and require the introduction of empirical formulæ. From this point on, the author therefore bases his discussion upon the law of expansion of the powder gases evolved by Prof. Franklin, of Lehigh University, which assumes that the muzzle pressure continues to act on the gun with a constant value during the total time of the after-effects, and then drops to atmospheric pressure. The velocity of the powder gases at the instant of maximum velocity of free recoil is determined analytically. This value has been previously obtained by computation based upon the value of the maximum velocity of retarded recoil of the gun, which is determined experimentally. The idea is considered as a new one, which must be traced from its source. The usual nomenclature for the equations in mechanics is assumed.

[The Principles of Mechanics and Their Application (continued). By Prof. Dr. Dziobek, Privy Counselor, Germany, *Artill. Monatshefte*, Nov, '15. 15,000 words.]

(Note. Continued from *Artill. Monatshefte*, Sept-Oct, '15, see note, p. 81, *Int. Mil. Digest*, Feb, '16. The November, 1915, issue of the *Artilleristische Monatshefte* has never been received.—Ed.)

[The Principles of Mechanics and Their Application concluded. By Prof. Dr. Dziobek, Privy Counselor, Germany, *Artill. Monatshefte*, Dec, '15. 14,000 words.]

(Note. Continued from *Artill. Monatshefte*, Sept-Oct, '15, and Nov, '15. See note, p. 81, *Int. Mil. Digest*, Feb, '16. The November, 1915, issue of the *Artilleristische Monatshefte* has never been received.—Ed.)

#### —Ballistics—Lost Motion

[Notes on Lost Motion and Jump. By Capt. F. Conner, F. A. *Field Artill. Jour.*, July-Sept, '15. 6500 words.]

(NOTE.—This article is of a controversial nature and in reply to "The Effect of Lost Motion on Accuracy," by 1st Lt. R. A. Mix, C. A. C. *Field Artill. Jour.*, Jan-Mar, '15. It discusses the subject from the viewpoint of the practical field artilleryman.)

The author of the article on "The Effect of Lost Motion on Accuracy" shows a total lack of conception of the technique of artillery fire under service conditions, and of the fundamental ideas which brought about the construction and adoption of the modern 3-inch gun of long-recoil type.

The results of firing which the author uses for discussion are worthless, because service ammunition was not used and actual firing problems were not considered. They are also misleading, because the data used did not give the true range elevations. The attempt to calculate the jump by an ingenious mathematical analysis is unconvincing, and is based upon erroneous assumptions. By this analysis it is calculated to be 14 minutes, whereas the Hand Book, which is based upon proving-ground tests, gives about 7 minutes. Another erroneous assumption made is that the rotation of the cradle in elevation is about the pintle. The assumption that, for practical purposes, the recoil springs and friction may be neglected without affecting the length of recoil, is unwarranted. Although the author of this article tries to prove that the failure of the trail spade to engage has less effect upon inaccuracies than lost motion, the practical field artilleryman, from experience in service firing, believes otherwise. Moreover, firing reports show many errors due to irregularities in the matériel.

There is no doubt in firing practice many errors can be ascribed to personnel, but many of these have their ultimate origin in improper or faulty design and in lost motion in the matériel. When a shrapnel bursts at the muzzle, it cannot be ascribed to lost motion or personnel. The amount of lost motion in the traversing and elevating mechanisms gives such erratic results in volley fire sweeping that time-robbing and unusual methods must be devised in training the personnel to overcome these defects. Gen. Langlois has stated that the gun must return to its exact former posi-

tion immediately after firing. Another authority, Captain Campana, states that all guns in which such defects as jump or lost motion result do not deserve to be classed as quick-firing guns, but only as accelerated fire guns. All these conditions have been obtained in the French 75 mm. gun. The French have succeeded in constructing a field gun possessing range, mobility, accuracy, rapidity of fire, and power of projectile, with an increase in muzzle energy more than double that which we secured by the application of the same principle. The practical field artilleryman is no longer willing to admit, in view of the feats accomplished by other ordnance constructors, that a single requisite characteristic need be sacrificed in giving them a field gun which is free of the defects indicated.

[Supplemental Notes on Lost Motion. By Capt. R. R. Nix, O.D. *Field Artillery Jour.*, Jan-Mar, '16. 5500 words.]

(Note: This is a continuation of the discussion begun by the author in *The Effect of Lost Motion on Accuracy*, *Field Artillery Jour.*, Jan-Mar, '15, see *Int. Mil. Digest Annual*, 1915, p. 180, to which reply was made in an article *Notes on Lost Motion and Jump*, by Capt. F. Conner, *Field Artillery Jour.*, July-Sept, '15; see *Int. Mil. Digest Quarterly*, Mar, '16, p. 79. The article is of a controversial nature and in reply to Captain Conner's article.)

The criticisms made by the author of "Notes on Lost Motion and Jump" show his tendency to attack only carefully selected extracts and partial quotations, and a failure in many cases to express a belief or a fact in its entirety. Statements of facts and opinions confirmed by these facts are of real importance, whereas quibbles and mere verbal controversies accomplish nothing.

The original discussion on lost motion did not consider methods of fire which precluded high accuracy, such as sweeping fire and fire at will. Sweeping is employed only with time shrapnel and during fire for effect. Moreover, the Drill Regulations state that after the first round the gunner disregards accurate laying for direction. There are many other factors which affect accuracy and contribute to derangements more or less considerable in deflection and elevation. In the original article it was especially emphasized that only the lost motion in the elevating and traversing would be discussed.

The idea of checking the laying in sweeping fire by the panoramic sight and the quadrant may be considered as impracticable and treated with levity, but nevertheless, the gunner has a ready means of checking by glancing at the azimuth scale. Where high accuracy is demanded, the laying of the field piece should be verified by the panoramic sight and quadrant, or checked by the azimuth scale, or as is necessarily the rule in accurate laying, loading should precede the laying. In the long run this may prove both a time and an ammunition saver. In special methods of fire where rapidity is the paramount con-

**FIELD ARTILLERY—Continued**

sideration, it may be advisable to disregard to a limited extent high accuracy.

There is of necessity a certain amount of play in gears, worms and bearings and tolerances are allowed on all sets of drawings. An increase in play is also to be expected, due to wear. In spite of the critic's effervescence over the "soixante quinze" and his quotations from Langlois and Campana, it is doubted whether the French have adopted the split-trail model of Col. Deport. Although there is no intention of decrying the acknowledged merits of the Deport gun, experiments made at Rock Island arsenal with one of these guns, show that this type has just as much as, if not more lost motion than, our 3-inch gun. It is understood that Col. Deport has redesigned his carriage and introduced several features of the Pilot 3-inch Model 1913, built at Rock Island.

The calculation of the jump to be 14 minutes was based upon certain theoretical assumptions which were purposely chosen for their extreme values in order to obtain the most unfavorable conditions. This accounts for the discrepancy when comparing with the jump of 7 minutes given in the hand-book. The futility of an exact mathematical computation of the jump was appreciated, and the method outlined was presented merely as a correct guide to be applied by common sense and experience.

The jump of the 3-inch gun is not sensibly affected by the presence or absence of the elevating and traversing mechanism. The jump of the projectile is uninfluenced by failure of the spade to engage. This is positive and was determined by the Ordnance Board in Mar, 1914, and again shown in tests made at West Point, N. Y. The statement is again made that errors are not entirely due simply to lost motion in elevating and traversing gears, and before any sweeping generalizations are made a proper analysis should be made to determine the causes which produce errors. Such an analysis would prove of value also to those who attribute all irregularities solely to lost motion in gears.

In dissecting this technical subject we are brought face to face with the limitations of our matériel and personnel. The ordnance constructor must perfect the mechanical parts to eliminate such errors in the matériel, but our field artillery officers must meet them half way and by proper training of our gunners instruct them to naturally and automatically take up such errors as are due to tolerated lost motion in gears.

**—Defense Against Aircraft**

[Overhead Concealment for Field Guns. By Lieut.-Col. C. Holmes Wilson, R. F. A. *Jour. Royal Artillery*, Dec, '15. 300 words. Illus.]

The advantage of screening guns from aircraft observation has been brought forward forcibly during the present war. The following method of doing this has achieved re-

markable good results. A large net, 30 by 20 feet, supported by poles, was erected over both gun and wagon, and then covered with grass or with leaves or twigs from neighboring trees. The covering must harmonize with the surrounding country.

[Concealment and Protection of Artillery from Artillery Fire. By Maj. W. S. McNair, I. G. D. *Field Artillery Jour.*, Jan-Mar, '16. 2500 words.]

In the present European war, many changes in methods have taken place due to the use of new mechanical appliances. Various reports and accounts suggest new lines of work in our peace training. Improvements in means of observation and communication have made cover more important. The use of aeroplanes has necessitated the screening of batteries from above. Batteries should avoid exact alignment and accurate intervals. Straight lines can be broken by using branches and leaves on the tops of shields and wheels. Brilliant points on the material must be covered. Guns being easily disclosed by flashes at dawn or twilight, discretion in firing must be used when it is known that aero or other observers are active. Dust due to the blast of discharge is also conspicuous. Various expedients may be used to suppress this dust, such as paulins, water, crude oil and brush mats. Movement among the personnel also attracts attention. Positions in the shadows of woods are not easily disclosed, but have other disadvantages such as easy adjustment of fire by the enemy. The English frequently spread nets over their guns and cover the net with grass, leaves, etc. When there is no parapet, small nets are also set up in front of the section.

The use of dummy guns to draw hostile fire, although it may appeal to popular imagination, is usually impracticable because with 15 to 30 men per yard of front, the terrain in rear of the first line is well occupied by other troops who would suffer loss and annoyance by such a ruse. Artillery fire is frequently directed by observers in the front line trenches, or from elevated positions in rear, such as towers, trees and captive balloons. Concealment from such observers is often practicable by placing batteries behind hedges, embankments or woods, in the midst of brush or high standing grain. Guns must, however, always be placed with a view to fulfilling their mission. Therefore, artificial cover will frequently be necessary. Practically the same methods already mentioned for concealment from aircraft also apply here.

Shields are excellent protection against shrapnel fire, but additional protection is needed against shell fire. If a battery comes under properly adjusted shell fire, there is nothing left to do, except for the personnel to retire to bomb-proofs and there patiently await the destruction of their matériel. Immunity from accidental shell bursts can be obtained by digging deep pits for howitzers or for other guns and by building up a parapet for each section, covering it in front

and flank. Protection from bursts in rear may be obtained by a low parapet or by placing the caissons in rear. Bomb-proofs should also be provided outside the emplacement for occupancy by the men when not serving the guns. The use of light overhead cover as protection is of doubtful value, and heavy cover is usually impracticable.

Advanced observing stations must be carefully concealed. The scissors observing telescope is a very conspicuous object and should be carefully screened. A battery seen is a battery lost. The character of modern combat and the necessity for concealment have imposed upon the artillery a difficult duty, namely, that of extending its communication system far to the front and of using it under difficult conditions. Wires must, therefore, be protected; lines must be duplicated. Our present system of communication needs many improvements to adapt it to trench warfare.

The present conditions of warfare in Europe are due to the employment of immense armies, about evenly matched, with their flanks secured. If one side succeeds in breaking through, then the elaborate protection and means of concealment and the permanent system of communications will be impracticable, because changes of position will be frequent. The work of the artillery will then be more as laid down in our Drill Regulations, which are based largely upon the battle of maneuver.

It is recommended that advantage be taken of aeroplanes near instruction grounds, and that problems in concealment be worked out. During the coming firing practice season, many problems approximating conditions of trench warfare and involving difficulties in communication should be worked out.

#### —Defense Against Aircraft—Concealment

[The Masking of Artillery in the Field. By Martin Wells. *Scientific American*, Feb 19, '16. 1700 words. Illustrated.]

In former times masked batteries, screened from observation from the front, were employed to introduce the element of surprise into artillery action. With increased range, the problem of screening from the front was simple until the appearance of the aeroplane. Now concealment from overhead observation is necessary.

Advantage is taken of every irregularity of the ground to screen artillery from view. The simplest concealment is in a forest where the judicious use of brush serves as an effective screen. Even if the trees and brush are sparse, skillful use may be made of them. Grain fields, especially where the grain has been cut, lend themselves well to the concealment of artillery. The wrecks of houses serve the purpose well, screens being made of rough panels nailed together. In all cases, concealment is facilitated by painting the guns to match their surroundings, mottled effects being especially effective.

It is the rule for gun crews to take cover or remain motionless when hostile aeroplanes are overhead.

The observation posts of the batteries are in the front line, and are usually in duplicate so that a change can be made and the battery remain in action even if one observation post is destroyed. These observation posts are in telephone communication with the batteries, the telephone lines being also generally in duplicate.

See also

#### ANTI-AIRCRAFT ARTILLERY

##### —Equipment

[Current Field Artillery Notes. Editorial. *Field Artillery Jour.*, Oct-Dec, '15. 1500 words. Illus.]

A sub-caliber tube for use with spot light cartridges can be made out of a small 22-caliber rifle placed longitudinally between two pieces of yellow pine wood, 2 in. x 4 in, 15 ins. long, each piece being grooved to fit the barrel. The stock, trigger guard and breech of the rifle are left protruding from the end of the block.

A canvas box has been made for use of batteries on march or travel. It consists of heavy 12 oz. white duck canvas strongly sewed together as a box, size 22 ins. x 20 ins. x 32 ins. When properly packed it is very rigid. Carrying handles of half-inch rope are provided at each end. This box can be used for many purposes.

The use of personal arms for the field artillery has always been frowned upon in our service for fear that the artilleryman might be tempted to defend himself with them and desert his gun. Small arms are almost everywhere used with the heavy artillery, ammunition trains and pack artillery. In our service the suggestion has been made to assign machine guns to each battery for close defense. There is no doubt that the possession of fire arms adds to the morale of the individual and will be very useful to scouts, observers, couriers and other men separated from their commands.

The principal nations now engaged in war entered with the following arms in the hands of the artillery personnel:—

Austria: Horse artillery, except drivers—revolvers;

Other artillery—rifles;

Ammunition columns—rifles.

England: Ammunition columns—carbines;

Other artillery—drivers, revolvers; cannoners, carbines.

France: Horse artillery—revolvers;

Other artillery—cannoners—carbines with bayonets.

Germany: Heavy artillery—rifles;

Other artillery—mounted men, automatic pistols; cannoners, short range carbines.

Italy: Mountain artillery—carbines;

Ammunition columns—carbines;

Other artillery—no hand arms.

Russia: Ammunition column—carbines;

Other artillery—revolvers and sabers or knives.

Bulgaria: Reported that in the Turkish war they had no hand arms for artillery. Escorts were usually provided.

**FIELD ARTILLERY—Continued**

Greece: No escort assigned; called for when needed; cannoneers are armed with the carbine.

Nothing will be done in our service until reports of observers are received showing present practice of the nations at war.

**—Fire**

[Correcting Line of Fire When Situated in an O. P. By Major F. H. Metcalfe, R. G. A. *Jour. Royal Artillery*, Feb, '16. 250 words, 1 fig.]

(This is a technical artillery article and does not admit of satisfactory condensation.)

**—Fire—Accidents in**

[Note. *Army & Navy Jour.*, Mar 4, '16. 200 words.]

There have been 420 accidents in the French field artillery due to premature burst of shells. In the effort to carry large explosive charges, the shell walls have been reduced to a half-inch thickness. This is considered a probable cause of premature burst. Our own shells are two or three times as thick. Another probable cause is chemical action on the metal of the shell. The interior of our shells is varnished, and now the Ordnance Department is experimenting with aluminum lining.

**—Fire—Adjustment of**

[Adjustment of Height of Burst by Variation of Site. By Lt. Col. E. F. McGlachlin, 3 F. A., and Capt. L. J. McNair, 4 F. A. *Field Artillery Jour.*, Oct-Dec, '15. 7700 words.]

(Note.—A technical discussion of interest to field artillerymen only. This article is in reply to an article "The Adjustment of Shrapnel Fire," *Field Artillery Jour.*, July-Sept, '15, see also INT. MIL. DIGEST, p. 25, Jan. '16.)

In this former article, a method of adjusting the height of burst was proposed by varying the angle of site. To insure air bursts on the first salvo, 8 mils are added to the determined site. On the observation of this salvo, the height of burst is changed by an appropriate change in the angle of site. After this all changes are made by the corrector. Many assumptions are made which are not entirely correct. Among these assumptions are: (a) there is a corrector for the day; records show variations of 1000 yds. in range and 6 points in the corrector; (b) a corrector for the day may be established; this requires registration of fire, which is forbidden when it will disclose the position; (c) expert use of the range finder will ordinarily give ranges within 200 yards of the correct range; assumption practically correct; (d) the site determined is the least accurate of the firing data; records of the School of Fire do not show this; (e) the site determined will frequently be as much as 8 mils in error; the probable error is only 2.5 mils and the probability of exceeding 8 mils is 1 per cent.; (f) the range finder will be accurate and expertly used; but it frequently gets out of adjustment, and frequently crude methods must be improvised in estimating the range; (g) the site may vary between 280 and 320 mils; this is un-

usual; (h) matériel, ammunition and gun service are perfect; they never are in peace and will certainly not be so in war; (i) the ordinary country will be so difficult as to make the calculation of site inaccurate; this may be true, but really counts against the method.

The purpose of any proposed method is plainly to save both ammunition and time in the adjustment of time fire by indirect laying. Now all methods must be simple and direct and easily applied, described, and understood. A governing factor in the consumption of time and ammunition in adjustment is proximity to the target of the first range used. This is affected by—(a) the determination of the initial range; (b) the variation of the range center; (c) the variation of the range of burst center.

In the present service or corrector method, the proximity to the target of the first range used depends on: (a) the error of the initial range determination; (b) the range error due to the site determination; (c) the variation of the range center. In the proposed method it depends upon: (a) the error of the initial range determination; (b) the variation of the range of burst center.

Upon this basis the two methods are compared, using the voluminous records of the School of Fire for the necessary data. The conclusions are that for adjustment of time fire in indirect laying, the site method will not save ammunition. The chances are also that time will be lost. But there are other objections. The site method deliberately raises the mean burst center 8 mils, and thus sacrifices considerable physical effect besides the moral effect of surprise losses. Moreover, the method is admittedly not applicable in percussion fire or direct laying. It is therefore not general. While the site method will practically always give a group of bursts in the air on the first salvo, there is no reason to believe that on the second salvo more information will be obtained than would result from the corrector method on the first salvo. The corrector is simpler and admits of simultaneous adjustments of range and height of burst. So far as the trajectory is concerned, both methods are equally accurate.

We have established a particular method applicable to our matériel, and it should be adhered to. The site method is applicable in special cases which should be recognized; the corrector method applies to the ordinary case. Misuse of either will lead into difficulties. A full knowledge of both and their correct application will always give satisfactory results.

[The Plotter. By Major M. R. C. Nanson, R. G. A. *Jour. Royal Artillery*, Mar, '16. 1800 words. Illus.]

Most people probably will say a plotter is of little use in mobile warfare. A year ago the writer, having a new battery to train, and having no plotter to work out T. O. B. problems, had a plotter made which turned out to be in such handy form that he concluded to

write a description of it after gaining some experience in mobile warfare. But experience being slow in coming, this description is based upon suppositions, and upon experience with such types of country as he has seen.

If good maps are available, or if the battery is not far distant and in plain sight from the observing station, a plotter is hardly necessary, as the line of direction can be guessed at with fair accuracy, and correction can be made by observation.

But when operating in a country poorly mapped, or where there are no readily distinguished landmarks by which positions on the map can be recognized, or if the battery is distant from and cannot see the observing station, then some form of plotter will be of assistance. As long as the magnetic bearing and range of the target from the observing station can be obtained, and the magnetic bearing and distance from the battery have been carried forward in proceeding to the observation station, then the guns can be given the magnetic bearing of the target quite independently of the map.

This plotter is in two pieces: one is a semi-circle of white celluloid and the other a rectangular piece of transparent celluloid  $6\frac{1}{4} \times 3\frac{1}{4}$  inches. The size is convenient for carrying in the pocket.

(Diagram of the plotter and description of its use, are given in the complete article.)

[Rule for the Solution of Certain T. O. B. Triangles. By (Temporary) Major E. T. Dixon, R. F. A. *Jour. Royal Artillery*, Mar, '16. 1000 words.]

The following is a short rule for the solution of certain T. O. B. triangles:

(a) With a forward observing station—Divide the exterior angle at O in the proportion of the opposite sides.

(b) With a rear observing station—The apex angle is to the angle TOB as the base is to the range, the base being relatively small.

(Examples illustrating the use of the rule and comparing its accuracy with other methods of solution are given.—Ed.)

#### —Fire—Adjustment of Angle of Site

[The Adjustment of Shrapnel Fire. By Reg. Sergt.-Maj. B. Conless, 6th F. A. *Field Artill. Jour.*, July-Sept, '15. 5000 words.]

(NOTE.—A technical discussion of interest to field artillerymen only.)

If all the instruments, guns, ammunition, and personnel of a battery were perfect, and the conditions of weather ideal, then all firing would be absolutely accurate and the trajectory would pass through the target. Such ideal conditions, however, do not exist. As a result, we must be satisfied with a bracket which surely encloses the target. Of all the data sent to the battery, that most likely to be in error is the angle of site. The corrector usually remains the same during the course of the day; the range error of the range finder is usually very small, and experience shows that a bound of 200 yards will generally bracket the target. But the angle of site is seldom

accurately measured. In difficult terrain, where targets may be so located as to cause great variations in the angle of site, and where the difference in level and position between the observing station and the battery is a little greater than under ordinary conditions of terrain, the angle of site will usually be in error as much as ten mils.

An error or a change in the angle of site merely raises or lowers the burst vertically. It does not affect the range of burst or the burst interval. A change in the corrector changes the range of burst, interval of burst, and the height of burst. A change in the range alone will affect the range of burst and the interval of burst, but not the height of burst. Now, the object of adjustment is to determine all the elements of the data so that the trajectory will pass through the target. The proper range of burst and interval of burst for effect will then be obtained by raising the corrector.

During the adjustment, the range of burst should not be varied, but the burst raised or lowered by an appropriate change in the angle of site until observation can be made. If the bursts are in the air for the first salvo this is very easy. It becomes very difficult, though, when grazes are obtained, especially grazes short. To obviate this, that is, to surely obtain air bursts from the very beginning, it is therefore advisable to always increase the measured angle of site by the greatest error which you have known yourself to make. This is advisable, anyway, because there is always an error in the angle of site. The target is thus bracketed in range by low bursts obtained by changing the angle of site. In passing to fire for effect, the height of burst is then raised by the corrector.

These principles have given good results in the writer's regiment, where they are taught. It is said that the adjustment is more rapid, more accurate, and requires less ammunition than if adjustment were made by changing the corrector.

#### —Fire—Conduct of—Rapidity

[Rapidity of Service 3-in. Batteries. Editorial *Field Artill. Jour.*, July-Sept, '15. 150 words.]

Statistics compiled at the School of Fire, Fort Sill, give the following classification:—

Time from identification of target to announcement of first range:—	Classification
10 seconds or less.....	Excellent
10 to 20 seconds.....	Very good
20 to 40 seconds.....	Good
40 to 60 seconds.....	Fair
Over 60 seconds.....	Poor

#### —Fire Control

[Ranging from an Observation Post to the Flank. Anonymous. *Jour. Royal Artillery*, July, '16. 1500 words. Illus.]

In the present war, battery commanders are frequently required to conduct the fire of their batteries from an advanced or flank observation station. Unless the B.C. grasps the theory of the method, he will find the operation very complex and will usually give up in despair.

## FIELD ARTILLERY—Continued

Now in ordinary ranging, that is when the observer is on or near the line of fire, the usual method is to first correct for deflection and then determine the minimum bracket, that is a range which is surely short and one that is surely over. When the observing station is on the flank, the B. C. should proceed on the same lines, but instead of basing his observations on the line gun-target, he should refer his observations and also make his corrections on the line observer-target. This will make it necessary, after the first shot is fired to usually make two corrections for each shot, one in deflection and one in elevation, whereas under the usual method when the observer is on or near the line of fire, only the elevation need be corrected after the first shot until the bracket is determined. In order to know by what amount to correct either the deflection on elevation to bring the next shot on the line observer-target, it is necessary to know the co-ordinate factors by which an apparent deviation may be corrected. The first shot is usually corrected by a change either in deflection or in elevation. For subsequent shots a combined factor is employed whereby both deflection and elevation are simultaneously corrected to keep the shot on the line observer-target. Now, if the shot does not fall on this line, the observer must remember that it is due to the probable error of his gun, in other words, if he had repeated the round it probably would have responded as expected and been on line. The whole secret is, therefore, to repeat whenever the shot does not respond to the proper corrections and fails to fall on the line observer-target. If a second shot again falls in the same place then a correction should be made again as before.

When the observer is directly on the flank the method is to determine the range or elevation first and then bracket the deflection. Whenever the angle between the lines observer-target and battery-target is greater than 50° (900 mils), it is best to bracket by changing the deflection. With heavy artillery, ranging by piece is recommended. For very narrow targets or a very large probable error, it may be necessary to repeat shots two or three times.

The factors may be obtained from a table compiled for this purpose for different types of heavy ordnance. The known quantities are the range (gun-target), the distance (observer-target), and the angle which these lines make. Required (1)  $O$  = angle at observer corresponding to an increment of 100 yds. in range; (2)  $B$  = angle in deflection at gun to move shot 100 yds. along line observer-target. (3)  $E$  = gun elevation corresponding to an increment of 100 yds. in range. The factors then are:

- $\frac{E}{O}$  —= to correct the elevation only;  
 $\frac{B}{O}$  —= to correct the deflection only;

$\frac{B}{E}$  —= combined factor, to correct both elevation and deflection.

[New Projectiles for Artillery. By E. A. Ramos da Costa, Captain of Artillery. *Revista de Artilharia*, April and May, '16. 4000 words. 10 illustrations. To be continued.]

(A description of the Krupp and Erhardt field artillery projectiles, made before the present European War for use of Holland and Turkey, in the effort to find a single projectile to perform the service of explosive shell and shrapnel, together with a mention of anti-aircraft projectiles, and the explosives and fuses used in each.)

[New Projectiles for Artillery. By E. A. Ramos da Costa, Captain of Artillery. *Revista de Artilharia*, June, '16. 6000 words, 4 illustrations, and nine tables. Concluded.]

(This article is concluded from the journal for April and May, and gives the comparative results of firing the two classes of projectile at different targets.)

[Powder for the 7.5 cm. R. F. Gun, Made at Chelas Factory. By Mario da Silveiro Guerra Freire Themudo, Lieutenant of Artillery. *Revista de Artilharia*, April and May, '16. 750 words.]

(A few notes on this powder and a comparison with the German powder for similar guns.)

[Graphic Aids in Directing the Fire of Larger Bodies of Artillery. By R. Sbg. *Artilleri-Tidskrift*, Part 5. '15. 1800 words. 6 sketches and diagrams.]

The direct supervision and direction of fire of a field artillery regiment before and during action certainly involves many serious difficulties, and any means that can simplify it for the regimental commander and make the survey of the grouping, possibility of fire over a certain area, etc., of the regiment simpler and more easily taken in at a glance is therefore very desirable.

The issuance of battle orders, the method of putting an artillery regiment into battle position, arranging for communication by means of telephones, signalling or couriers and the employment of the prescribed means for the observation and direction of fire will not be touched upon. Here will only be described certain *graphic means* that are employed to make the directing of larger bodies of mobile artillery easier, namely, suitable sketches made by the reconnaissance patrols of the artillery and "fire sketches" for battery, battalion and regiment.

In a reconnaissance made preparatory to putting a force of artillery into position for action, the reports showing the possibility of covering a certain area with the fire of the guns should preferably be given in the form of sketches because these give a quicker view of the conditions than longer written reports.

The amount of detail in these sketches depends among other things upon the time avail-



able for making them. In certain cases the time available is limited to minutes, in other cases hours may be allotted to it. In the first case the sketch must be of the simplest kind and in the latter case more details can be given.

An example is given of an officer's patrol sketch where he has been directed to ascertain and show the possibility of putting in artillery to fire against a certain section of country. The number of batteries that can be put in the area examined is indicated by the corresponding number and location of battery signs, the positions suitable for directing the fire by a circle; the way to get to the battery positions from the road by dotted lines; the approximate area that can be covered by the fire, by a sector, and where larger "dead spaces" occur they are noted on the sketch.

The "fire sketches" for a battery must be so simple that a person without special training can draw them quickly; and at the same time they should give a clear view of the sector of fire with the spaces that can and cannot be reached by the guns in question. They should also be such that the different battery sketches can readily be combined and give a sketch from which the regimental commander can at a glance see what batteries and battalions can concentrate their fire upon a certain area. A *schematic* sketch of the sector of fire of a battery is given. This sketch is supposed to be made by the battery adjutant from the position selected for directing the fire of the battery, while the battery is moving into position. The area fired at is designated on these sketches by a line showing the enemy's front line, in which *blank* spaces designate the part of the front that can be fired at; *full drawn lines*, the part of the line that cannot be covered by fire; and *broken lines*, the parts of the lines that can only partially be covered. The sketch is made in the following manner. Certain distinctive and easily recognized orientation points are first put down on the upper line of the card used (suitably ruled into squares), lateral distances being spaced to an angular scale. The orientation points should be chosen as near the two ends of the area covered as possible and also near the enemy's front line, in order to lessen the errors in angular measurement if read from a point distant from the point at which the sketch is made. The scale is selected so that the side of a square on the card represents, for example, 100 or 200 yds., depending on the total width of the fire sector and the number of squares on the card. On a line (or lines) lower down on the card are then put in the limits of fire and spaces not covered, all measured by the same scale. Near the bottom of the card is sketched the position of the battery, fire control station and adjacent roads.

The *battalion firing sketch* is made in the same manner by the battalion adjutant, from the battalion commander's position, and as soon as the battery firing sketches come in their area of fire, etc., is sketched.

The *regimental firing sketch* is made up by the regimental adjutant, from the regimental commander's position, and filled in from the battalion reports.

To designate the area of fire of the different battalions colored pencils may be used, or single, double and treble lines. The location of the different battalions should also be approximately described.

By an examination of this sketch the regimental commander can at a glance see what parts of the front the different batteries can fire at and hence the objects to be assigned to each. Also how many guns can be brought to bear on any designated part of the enemy's line.

[Observation of Fire of Field Batteries. By Capt. Romolo Bruni. *Riv. Mil. Italiana*, July, '16. 4500 words.]

(Note. This article does not take into account the changes that may come from the teachings of the present war.)

Indirect fire has become the normal action of field artillery. This fact and the increase in range have made substantial changes in the observation of fire. It is more necessary than ever that the artillery shall support the infantry attack. The batteries must fire over the infantry and must keep up the fire as long as possible at the critical moment of the assault. Night operations are coming more and more into use. All these things tend to make the observation of fire more difficult.

As troops habitually seek cover, the targets for field artillery will be exposed for only brief periods; it is therefore necessary that the fire shall be rapid and effective when the target is exposed. The period of adjustment must be reduced to a minimum and the fire must become effective as quickly as possible.

Observation of fire consists in locating the point of burst of projectiles and estimating the effect on the target. Long practice is necessary. All the training of personnel, all the perfection of technical details of posting the battery and conducting the fire, will go for nothing and simply lead to waste of ammunition without proper observation. All the officers and the most capable enlisted men of the battery should be trained in observation, on all kinds of terrain and under various atmospheric conditions.

As a general thing, the observing station will have to be a considerable distance from the battery, communicating by telephone. The Italian Field Artillery Regulations recognize that the selection of the observing station has a preponderating influence on the choice of a position for the battery. The battery commander alone cannot obtain all the necessary information. He must be assisted by capable enlisted men as observers, and particularly by aircraft. He must receive prompt information of the effect of his fire, changes in the target, appearance of new targets, positions and movements of hostile troops, and progress of the action.

The observation service of the enemy must

**FIELD ARTILLERY—Continued**

be rendered as difficult as possible. The battery should be placed behind a ridge, preferably on the counterslope. In terrain heavily covered with vegetation, observation will generally be difficult, and dependence must be placed largely on aircraft. In night operations artillery fire is useful chiefly for moral effect, although material damage may be done if ranges are determined in daytime.

Ease of observation depends on topography and atmospheric conditions. In level country without houses, towers, or trees, observation becomes impossible without special appliances. In 1895 experiments were made with an observation ladder, consisting of a pole fitted with brackets for climbing and having a saddle at the top. Another device was a vertical tube arranged so that the observer at the bottom could see the country readily from the top. A later development is the observation cart now used, which gives the battery commander more security than he had with the ladder mentioned above. For night firing use is made of searchlights and illuminating projectiles. The aeroplane undoubtedly gives the most satisfactory observation service. Various methods of communicating between aeroplane and battery have been tried, but the radio is the best. Much practice is necessary to attain efficiency in this service; practice must be had under varying conditions of combat, terrain, and atmosphere. Observers must acquire the power to judge quickly the inequalities of ground, the formations and identity of troops, and the relative importance of the various things they see. The effect of the fire will depend upon the prompt receipt by the artillery of those items of information that are essential to its particular rôle.

See also

**SERAPNEL—TIMING OF**

**PERISCOPES—FOR ARTILLERY FIRE CONTROL**

—**Fire Control—Aeronautic**

[Aviation and Its Employment with Field Artillery. Anonymous. *Field Artill. Jour.*, July-Sept, '15. 1000 words.]

For artillery reconnaissance, a small, light, fast and easily transportable machine is required, three being assigned to each regiment. The pilots and observers should be trained with the regiment and participate in its maneuvers. This will produce better co-operation and make machines available when needed. In France, where aeroplanes are attached to corps and army headquarters, the artillery has often failed to get aeroplanes until the opportunity for their use had passed. It is recommended that an aviation platoon be assigned to every field artillery regiment.

[Co-operation of Aerial Machines in Artillery Fire. By Captain Don R. Martínez. *Memo. del Ejército* (Chile), Oct, '15. 9000 words.]

The dirigible, because of the large target it presents to hostile fire, is not used in this service.

Captive balloons, having only a limited radius of action, are rarely used except with guns of position and in entrenched camps. In the absence of better means and against an enemy not provided with modern artillery they will still be employed.

Trains of kites will be of value when violent or contrary winds make balloon ascensions impossible. No practical use of kite trains has yet been reported in the present war, but the French have organized a war unit based on the invention of Capt. Sacconey. This consists of two superposed groups of cellular kites connected by a cable. The lower group tows the car, and the contrivance has been successfully used in trials to carry part of the personnel of the section to altitudes of 600 to 1000 m. in violent winds. For their employment, a wind with a minimum velocity of 20 to 30 miles is required.

The aeroplane, because of its freedom and rapidity of movement and other obvious advantages, is now the most generally used means of aerial observation, and its service with the artillery has been made the subject of regulation in all the great armies of Europe.

The general principles governing the use of the aeroplanes with artillery are now well established, but the methods of observation, means of communication, etc., vary in the different armies. Communication from the battery to the aeroplane is usually by white signal flags spread on the ground in rear of the battery to form letters or other code signals.

Communication from the aeroplane is by wireless, visual or sound signals, and by written message thrown to the ground. The English use a flash bomb (Very's light) in red, white, and green colors which are plainly visible in day light at an altitude of 900 meters and at a distance of 3200 meters. These lights are exposed singly or in combination in accordance with an elaborate code.

For sound signals, the English use a Klaxon horn which can be heard at 1600 m., from an altitude of 600 m. This is only used to warn the battery that signals will be displayed.

German methods have been carefully guarded, but a publication of 1914 describes an invention by Captain Scheimpflug for making satisfactory military photographs from an aeroplane in flight. This consists of a central photographic plate about which are arranged six cameras each making an angle of 45° with the plate. The resulting photograph is in the form of a hexagon covering a field of 152° and having a radius (inscribed circle) four times as great as the altitude at which the plate was exposed. Thus at an altitude of 1000 m., the area included in the photograph represents about 50 square kilometers.

In launching messages to the ground, the Germans use a pistol to discharge the carrier with sufficient velocity to overcome wind effects and to insure accurate and speedy delivery.

The French have given up the use of the wireless for short distances, and are employing a system of smoke signals. Smoke puffs from the engine exhaust are delivered in large and small clouds to represent the dashes and dots of the Morse alphabet. These signals are said to be readable at a distance of 10 km. As a result of experience in the present war, the French are using only bi-planes and have arranged their machines in three classes:

1. Long distance reconnaissance.
2. Short reconnaissance.
3. For bombardments.

Machines of the 2nd class are used for service with the artillery.

The development of the anti-aircraft gun has greatly increased the difficulties and dangers of observation, and the aeroplane must now maintain an altitude of at least 2000 m. to be safe from hostile fire.

[Direction of Artillery Fire from Aeroplanes. By the School of Fire for Heavy Artillery, Japanese Army. *Kaikosha Kiji*, Oct., '15. 6300 words.]

(This article gives a detailed description of experimental firing at targets with 15 cm. howitzers, 141 rounds of practice shells and 4 common shrapnel were fired. Observation of the hits was from aeroplane. Only conclusions and opinions are here given.)

1. Effective fire may be delivered against invisible targets from 2500 to 4300 meters by observing from aeroplanes at altitudes less than 500 meters.
2. As the altitude and range increase, observation is more difficult, and special field glasses for this purpose should be used.
3. Officers should be practised in recognizing the target quickly and observing the fire, especially at the higher altitudes and longer ranges.
4. The aeroplane used should have characteristics for steadiness rather than for long flights, and the aviator and observer should be thoroughly conversant with and enthusiastic in their duties. They might well be one and the same man. Therefore, officer-aviators should have a general understanding of artillery fire.
5. Signal flags to indicate right, left, short and over should be used, thus hastening and simplifying the accurate transmission of information to the firing battery.
6. The greatest range attempted was 4300 meters and the greatest altitude was 500 meters, which is not safe from hostile fire. Further investigation at greater ranges and altitudes is necessary.

[Adjustment of Fire, by Use of Aeroplanes. Translated from the French F. A. D. R. *Artill. Monatshefte*, Dec, '15. 2000 words.]

In adjusting fire, aeroplanes are used at mid-ranges, because short ranges would make it dangerous for the aeronauts, whereas long ranges make observation difficult. The observer must be well versed and proficient in

F. A. methods and conduct of fire. One aeroplane is assigned to each chief of corps or divisional artillery, who then assigns the machine to a battalion commander upon application. When several artillery groups are firing, the aero observer will experience difficulties in observation.

In adjusting the fire of a battery, the battery commander first gets a 100 m. bracket on the covering mask or crest. Having obtained this, he sets out in rear of the battery two rectangular signals made of sections of white cloth, the surface area of each signal being 2 m. square. These signals mark the direction of fire. The aeroplane, with pilot and observer, starting from a point well in rear of the battery, then flies in the indicated direction at a height of at least 500 m. As the aeroplane passes over the battery two orientation volleys are fired with six seconds between volleys. Percussion fire is used, the first volley being 300 m. greater and the second volley 100 m. greater than the long limit of the 100 m. bracket on the crest. As soon as the aeroplane observer has observed these orientation salvos, he turns about and when passing over the battery drops a card contained in a weighted carrier. This card shows graphically the position of the two volleys with respect to the target.

The above process is repeated until an appropriate bracket is obtained. It will usually be impossible to reduce the bracket below 150 m. and in general the B. C. must be content with a large bracket. When the fire of the battery has been adjusted, the B. C. removes his signal flags which is an indication to the aeroplane to cease observing and return to the landing plane.

[Domestic Notes. Course in Field Firing in 1915. *Mem. de Artilleria* (Spain), Jan, '16. 16,000 words, 6 figures, 1 map.]

For the first time our artillery was assisted by the Aviation Service.

The targets consisted of the regulation silhouettes, boards of black poplar for the determination of the efficiency of the balls, batteries composed of obsolete matériel and provided with shields of weight and resistance analogous to the new field artillery matériel, Mod. 1906, dummy batteries representing the heavy field matériel; dummies of paper representing batteries limbered up and from the flank, etc.

Communication was established by means of telephones, heliographs, Mangin lights, and flags.

In the execution of the program, 120 ordinary shell, 213 explosive shell and 1166 shrapnel were used.

Fourteen exercises were carried out. These included firing at various targets in view and hidden, night firing with and without projectors, firing assisted by aeroplanes, and demolition firing against a wall. Condensed accounts are given of each exercise.

Conclusions drawn with respect to the aeroplanes are:

1. The tactical situations of modern com-

**FIELD ARTILLERY—Continued**

bat demand the co-operation of aerial observation in artillery firing.

2. This is not absolutely required in all circumstances of combat, but its opportuneness in the first phases cannot be gainsaid, especially in offensive work against an enemy solidly established in position who cannot be reached by any other method.

3. The above deduction assumes that aerial observation is preferably applied to the fire of artillery of larger range and power, but it is also necessary for the modern field artillery.

4. The co-operation of this service ought not be improvised. It should be permanent and fixed. It requires:

(a) In the apparatus, ability to ascend rapidly, to remain in observation at the required height without excessive maneuvering, a minimum area hidden from the observer, lightness and ease of transportation.

(b) Special instruction of the pilot or observer in artillery work.

(c) That the service of aerial observation be maintained from the commencement of fire until its accuracy is verified.

(d) Strict co-operation between the aviator and the battery commander. This requires that the former be assigned permanently to the service without other duties.

5. The above conditions do not interfere with what is the fundamental training of all branches of aviation after which specialization in the above-mentioned service will require the constant aid and co-operation of artillery units.

6. Whatever may be the future organization under which aviators serve, from the moment they begin their co-operation with the artillery, they will remain under the orders of the chief of these forces as auxiliaries.

7. The actual equipment of our military aviation service, or at least the apparatus with which the school has experimented up to the present, must be considered deficient not only because of the lack of the characteristics above referred to for the military aeroplane, but also because of the uncertainty of its assistance.

8. While improved practice may impose modifications that there is no reason to suppose will be fundamental, the methods that have been tried for connecting the aviator with the battery and the methods of fire used by the latter appear to satisfy the requirements.

9. The use of fixed balloons has the advantage over aeroplanes of exactness of observation, but they are not so adaptable to the artillery requirements and they offer an easy target. They are better fitted for fixed positions than the field of maneuvers.

10. The pilot should be subordinate to the observer.

[Getting the Range for Artillery Fire. *Flying*, May, '16. 650 words. Five illustrations.]

Observation for artillery fire is now made from aeroplanes, man-lifting kites, and cap-

tive balloons (mostly kite balloons). When the aeroplane is used, it makes two observations the first for line and the second for range. Messages are sent from the aeroplane by smoke signals, colored lights, radio, or by dropping cards; and are sent to the aeroplane by forming code figures with strips of white canvas on the ground.

**—Fire Control—Instruments and Equipment**

[Concerning Some Instruments for Field Artillery Officers and Staffs. By Captains Huber and Bandi, Field Artillery. *Artill. Monatshefte*, Sept-Oct, '15. 3000 words, illus.]

The present war has shown that direct laying will be limited to very exceptional cases only. The use of light pocket instruments to lay the guns therefore becomes very important. A few of these instruments and their use are given below:

**Sitometer Prompt:**—Used by many field artillerymen; a small pocket instrument which measures horizontal angles up to 800 mils, and angles of site with sufficient accuracy. By affixing reflexing prisms, larger horizontal angles may be measured.

**Universal Instrument:**—A small combination aiming circle and magnetic needle, pocket size, measures horizontal, vertical and magnetic angles. In practice, used principally for magnetic bearings.

**Mil Protractor:**—A rectangular protractor graduated in mils, used when laying by the map. This is used in connection with the Universal Instrument, the magnetic bearings being corrected to astronomical bearings.

**Pocket Aiming Circle and Plotter:**—This instrument becomes of immense importance in the conduct of fire when the observing station is at a great distance from the firing battery. It is being used both by the light and the heavy field artillery in conducting fire from a station in the advanced infantry trenches. The instrument consists of an azimuth circle graduated in mils, upon which are mounted two graduated range guide rails representing the line from the observer to the target, and the line from the observer to the battery. These two rails are connected by a third graduated rail representing the line from the battery to the target. The deflection at the observation station is first measured and set off on the instrument; then by sliding the origin along the guide rail in the direction of the right gun or the battery, the proper angle at the battery may be read off directly. The instrument is used in connection with the Universal Instrument mentioned above. The following problems in indirect laying may be quickly solved by means of this instrument and plotter:

(1) Laying the battery from a distant observing station.

(2) Measuring offsets for changes of target.

(3) Orienting the observing station in case of a change of station.

(4) By the battalion commander for the designation of targets.

(5) As a range finder.

[Sitogoniometer, Model 1911. Trans. by Capt. N. E. Margetts, 3d F. A. *Field Artillery Jour.*, Jan-Mar, '16. 1000 words. Illus.]

(This is a description of a small pocket instrument which permits the measurement of angles of site, the position of the guns in rear of a mask to clear the covering crest, and the measurement of horizontal angles in mils. The instrument consists of a small aluminum box carrying two eye-pieces, two reflecting prisms, a spirit level, and the necessary graduated scales on ground glass. On its face is a parallax table.)

See also

#### TELEPHONY

#### —Fire Control—Instruments and Equipment—Buzzer

[The Service Buzzer Code. By 1st Lt. W. A. Capron, F. A. *Field Artillery Jour.* Oct-Dec., '15. 2500 words.]

Experiences in the European war show that the buzzer communication must frequently be used in lieu of the telephone in field artillery fire control. Noise and frequent line troubles make this imperative. Fortunately, the high secondary of the buzzer can be detected in the telephone receiver even when the line is completely parted. Ordinary grounds on the system scarcely diminish it. The Field Artillery having already a practicable code for the semaphore, it was natural that the same one should be extended to the buzzer. The Continental Code was adopted. The American Morse code is very impractical for buzzer work, and especially so during the stress and noise of gun fire. There is no objection if the Field Artillery and the Signal Corps use different codes, because the two will never come in opposition, the artillery lines being purely local and always in charge of field artillerymen. Moreover, in fire control from aeroplanes, a simple code adapted to the one in use by the field artillery is necessary. In radio communications from aeroplanes, the chief obstacle is the installation of a satisfactory receiving apparatus. Observers for this work should not be drawn from the flying corps, but from the field artillery, and therefore trained in its code. (A very complete and very practical letter code is then proposed by the author. It is appended to the article.)

#### —Fire Control—Instruments and Equipment—Semaphores

[Night and Day Rigid Semaphore. By Capt. G. F. Verbeck, 1st N. Y. F. A. *Field Artillery Jour.* Oct-Dec., '15. 1000 words, illus.]

The range of visibility of the present semaphore flag is very short in a strong wind. It is therefore proposed to substitute a rigid semaphore which can be easily transported and also used at night. The kit consists of two circular wire frames across which are stretched circular flags (white with red centers), a canvas carrying case, a battery box and attachments, wire, plugs, three lamps (2 white and 1 red), 2 spare lamps, and one extra battery. The backs of the flags are of olive

drab cloth making them invisible to persons in rear. The use of the lights permits semaphoring at night. They are visible at night up to 1500 yds. The total cost is \$6.74.

#### —Fire Control—Instruments and Equipment—Telephones

[Loud Speaking Telephones. By 1st Lt. D. Olmstead, F. A. *Field Artillery Jour.* Oct-Dec., '15. 600 words. illus.]

The object of the loud speaking telephone is to eliminate all persons between the battery commander and the executive in the transmission of commands. The instrument consists of a local battery of 6 cells, transmitter, receiver, horn, induction coil, buzzer, key, jack and wiring, all mounted on a base plate carried in an aluminum case; weight complete 3½ lbs. Line and ground connectors are used. It is intended to have some tests to find out the practical value of these instruments to the field artillery.

#### —Fire—Direct vs. Indirect

[Direct and High Angle Fire. By Lt. Gen. H. Rohne, German Army. *Artill. Monatshefte*, July-Aug., '15. 2300 words]

(NOTE.—A brief technical comparison of interest to artillery and ordnance officers.)

Only fire with angles of elevation over 45° should be classed as high-angle fire, whether delivered from artillery ordnance or small-arms rifles. The maximum range usually corresponds to an angle of elevation less than 45°. The smaller the air resistance, the nearer will this angle approach 45°. Range tables for direct fire guns are usually never carried out to the maximum range. For direct fire guns an increase in the angle of elevation will increase the range; the contrary is the case for high-angle fire. The corresponding change in range is the same in both cases. When the elevation is in the vicinity of 45° the corresponding changes in range are very small. For this reason, high-angle fire is usually begun at 50°. Against horizontal targets, angles over 65° are seldom used. When the angle exceeds 75°, projectiles begin to tumble and fire is therefore very inaccurate.

For direct-fire guns, the remaining velocity is constantly decreasing; for high-angle fire, it begins to increase beyond the maximum ordinate. The terminal velocities for both direct and high-angle fire are about the same for the same ranges. For the 28 cm. howitzer, it is 297 m.s. for all ranges from 7400 m. to 9800 m. The striking energy of small-arms bullets is insufficient to disable an airman flying at a height of 2000 m.

For direct fire, the time of flight increases with the range; for high-angle fire it decreases. The dispersion in deflection is much greater for high-angle fire than for direct fire; the dispersion in range is, however, less. The accuracy of fire in direct fire is three times as great as in high-angle fire, but the power to penetrate horizontal cover is five times as great in high-angle fire. The drift in anti-aircraft guns is very slight, because targets are usually struck in the first half of the trajectory.

**FIELD ARTILLERY—Continued****—Firing Regulations***Brazil*

[The New Complement of Firing Regulations for Field Artillery. By Castro E. Silva, Capt. of Art. *Boletim Mensal* (Brazil), June, '16. 2500 words.]

(A discussion of some of the articles of the Firing Regulations for field artillery, and modifications made by the new circular.)

**—Heavy**

[Editorial note. *Army & Navy Jour.*, Mar 18, '16. 150 words.]

Contracts have been placed with the Bethlehem Steel Works for four 4.7-inch field guns and carriages, and two 6-inch howitzer carriages and limbers. These new guns are for the additional field artillery regiments to be authorized by pending legislation. One of the present regiments is armed with this type of gun and howitzer.

[The Artillery of To-morrow. By First Lieut. Tobias Barros. *Memorial del Ejército de Chile*, Dec, '15. 500 words.]

Up to the time of the Manchurian Campaign, the ideal field artillery piece was a light, rapid-fire gun, which could be rapidly transported. The Japanese first recognized the necessity of heavy mobile guns. Germany immediately seized this idea, and to it she owes her successes in the present war.

No modern country can consider itself prepared for war, if it lacks guns of large caliber, which can be quickly moved, and which will open the way for the infantry attack.

We lack that material, consequently we are not prepared for war.

However we must not forget that we live in a mountainous country. Yet mountain artillery is not necessarily of small caliber. We must have heavy artillery; the means of transporting it is a problem for the technical branch to work out.

[Miniature Range for Indoor Instruction. By Lieut. F. Ahl, R. F. A. *Jour. Royal Artillery*, Jan, '16. 750 words. Illus.]

The range is built upon tables with a slope down to the front, and sand is used to model the terrain.

To indicate percussion bursts, there are buried in the sand large pieces of tin to which small pieces of brass tubing are soldered. A few lengths of rubber tubing are attached, one end to the brass tubing and the other ends carried outside the range. A large rubber bulb put over the outer end of a rubber tube and squeezed causes the sand to rise over the corresponding brass tube and gives a good imitation of a percussion burst.

Bursts in the air are represented by small electric lamps suspended from above the range. The lamps can be moved along the range and can be raised and lowered, thus giving a time burst at any point of the range and illustrating the effect of the corrector.

The target is placed at any convenient point on the range and the effect of fire is simu-

lated by the bursts. The range was fitted up at a cost of about \$30.

[Big Field Pieces in the War. *Army & Navy Jour.*, May 13, '16. 700 words.]

A recent memorandum from the War College Division of the General Staff (U. S.) describes the new weapons of both sides. The French are now using 370 mm. (14.6-inch) howitzers for the first time. This gun was under study when the war broke out, and is comparatively simple in construction. At the outbreak of the war the French artillery comprised 65 mm. mountain guns, 75 mm. field guns, and 155 mm. rapid-fire Rimmilho guns. Six regiments of 105 mm. guns were in process of being added when the war broke out, and are now in service.

The following calibers have been introduced: 150 mm. Schneider R. F. howitzers; 260 mm. howitzers; 305 mm. and 340 mm. naval guns mounted on railway carriages.

The German 42 cm. gun was very effective. It is claimed that the Krupp company has perfected a 54 cm. gun with a range of 38 miles. The Austrians use guns up to 45 cm. caliber in the field. The craters of 30.5 cm. and 45 cm. shells are twenty feet deep and thirty feet in diameter.

Early German successes were due in great measure to the heavy field artillery and its proper handling. The French relied upon their "75." The German heavy artillery, using aeroplane reconnaissance, was able to destroy whole batteries of "75's" without themselves suffering any damage.

The French made every effort to provide themselves with heavy artillery as soon as possible. By Mar, 1915, a number of 10.5 cm. four-gun batteries and a considerable number of 15 cm. r. f. howitzers were in service, and 14-inch mortars were under construction.

The lesson is that heavy calibers and good ammunition supply spell better support to the infantry, and this means success. The idea that the 6-inch howitzer, with its 120-lb. projectile, was the heaviest needed with an army is, of course, discarded, as well as the idea that the only use of the heavier pieces would be in the destruction of permanent fortifications. Howitzers from 11-inch to 16-inch calibers are now transported with armies in the field, and reports indicate that the successes obtained by the Germans and Austrians on the eastern front were due in no small measure to the use of these enormous field pieces. They must hereafter be regarded as essential.

[Decisive Effect of Heavy Field Artillery. *Scientific American*, June 3, '16. 200 words.]

The Germans and Austrians foresaw the possibilities of heavy field artillery and prepared accordingly. Early success and present-day resistance are largely due to possessing numerous heavy howitzers.

To-day the situation is changing. The French are now bringing into service their new 14½-inch howitzer, and the British are receiving considerable numbers of their new 11

and 12-inch howitzers. Russia is fairly well supplied by Japan. Italy is the best equipped of the Allies in heavy artillery.

[Heavy Field Artillery. By Gen. Bourelly. *Field Artillery Jour.*, Apr-June, '16. 1500 words.]

(Note. An English translation from "*La France Militaire*," Mar 18, 1916.)

[The Value of Heavy Artillery in Field Warfare. By Edward Foord. *Sphere*, July 8, '16. 1800 words. Illustrated.]

Artillery has loomed large in the public attention in the present war, and the use of heavy artillery has been particularly impressive. Yet heavy artillery has been in use since the sixteenth century. (Examples from early history are cited.) Heavy artillery was particularly effective at Leuthen (1757), and two heavy siege pieces played a prominent part in the defeat of the Russians at Inkerman (1854). The battle of Dokomos (Græco-Turkish War, 1897), where the Greeks had five siege pieces of 9500 yards' range to use against Turkish artillery with an effective range of 3500 yards, showed the possibilities of such pieces.

Mafeking and Kimberley, in the Boer War, also showed the power and value of heavy guns as the Boers gave much trouble with a few 6-inch Creusot guns that they used in the field. Only when the British added heavy artillery to their equipment was any headway made.

With all these examples, each British division in the Expeditionary Force had only four 5-inch guns, as against 54 field guns and 18 eight howitzers. The Germans were supplied with a much larger proportion of heavy guns. The Germans made it an artillery war, and the British cry has been for more and heavier guns and more ammunition. Now the Germans are about to be outmatched, not only in gunnery, but in sheer weight of metal.

[A Few Remarks on Heavy Artillery. By Col. Echagüe and Lt.-Col. Benítez. *La Guerra y su Preparación*, May, '16. 900 words.]

One of the teachings of the present war is the indisputable necessity in the modern army of a numerous and heavy artillery. In France, a few days before the outbreak of the war, this necessity was still under discussion, but in Germany it had been settled for at least 15 years. The question of type is apparently complicated. Without excessive multiplication of calibers, it is, nevertheless, necessary to have various types of heavy guns, because they all have definite functions. A rapid review of the different calibers employed by the Germans leads us to think that the modern army should have: (1) Heavy corps artillery, composed of comparatively light pieces, from 2000 to 3000 kg. with limber, pulled like ordinary field artillery, by six horses, and able to follow the infantry in all of its movements on any ground. The light 105 mm. howitzer, model 1898 and the heavy 150 mm. howitzer, model 1905 represent this type in the German Army.

These howitzers fire a projectile weighing, respectively, 15 and 40 kg. (2) Heavy army artillery, including the heaviest guns, drawn by 10 or 12 horses, weighing in general from 4000 to 6000 kgs., and firing from take-down platforms. In the German Army this artillery is composed of long 19 cm., 13 cm. and 15 cm. calibers, having a range between 14 and 18 kms., and also of the 21 cm. mortars, throwing a shell of 110 kgs. to a distance of 9 kms. (3) Heavy siege artillery, composed of the 28 cm., 30.5 and 42 cm. mortars of great range, and of naval guns, mounted on trucks. This formidable artillery naturally calls for motor traction.

Experience shows that before it becomes useless

the 340 cm. piece may fire 120 rounds,  
the 305 cm. piece may fire 165 rounds,  
the 231 cm. piece may fire 280 rounds,  
the 186 cm. piece may fire 450 rounds,  
the 152 cm. piece may fire 785 rounds.

The life of the 75 mm. gun is practically unlimited because it has fired more than ten thousand rounds without the slightest sign of wear. A great number of pieces have fired more than 25,000 rounds before it was found necessary to reline them. On completing a certain number of rounds, it is evidently necessary to renew, at the same time, all the pieces of the same battery so as to insure results under identical conditions.

[Heavy Field Artillery of the Entente Allies. *Revista de Artilharia*, July, '16. 2200 words.]

(Notes on the procurement of heavy field guns, with a brief description of the projectiles, and a mention of the principal calibers used in different countries.)

See also

COAST DEFENSE—BY MOBILE GUNS

FIELD ARTILLERY—MOTOR TRANSPORT

—Heavy—Draft

[Draft in Batteries of Heavy Field Artillery. By Capt. F. W. Honeycutt, 2d F.A. *Field Artill. Jour.*, July-Sept, '15. 1000 words.]

Mobility and traction of a heavy battery is a serious proposition, and even the presence of additional draft animals will be of little avail unless both men and horses have been trained in hard draft work. Never allow a team to attempt to start a carriage unaided after having failed in a previous attempt. In this case use cannoners on drag ropes. After a hard pull or a failure, always give the horses a breathing spell. An extra double tree with the necessary ropes should be carried to get the maximum draft in cases where the footing is bad.

—Horses—Care of

[In the Field. By Vet. G. E. Griffin, 3d F. A. *Field Artillery Jour.*, Jan-Mar, '16. 6000 words.]

Before a light battery takes the field, its horses should be properly trained and in hard condition. Militia batteries are woefully deficient in this respect, and very frequently this is due to the state authorities who are un-

**FIELD ARTILLERY—Continued**

familiar with the proper type of draft animal. The next important thing is the fitting of harness, which subject is well worthy the close study and personal attention of all field artillery officers. Before starting on a march, all shoeing should be carefully examined, a full set of extra shoes should also be fitted and marked and carried along for each horse. In addition, 5 per cent. of extra halters and 10 per cent. extra halter ropes should be provided.

In the field, many ailments peculiar to the march are bound to appear in horses. The stable sergeant should provide himself with a farrier's case and a supply of dressings, disinfectants, and drugs as shown in a table of contents of the farrier's chest. In addition, an ointment should be carried for the treatment of abrasions.

Camp should not be made near large cities.

Arrangements should be made in advance for water, fuel, forage, subsistence, mail, etc., and an itinerary carefully worked out. In time of peace, the marches should not exceed 20 miles per day. At the walk, the usual gait is  $3\frac{1}{2}$  miles per hour, including hourly halts. If this is kept up for the whole distance, it very soon becomes fatiguing to the men and horses. The practice of unlocking the collars and rubbing the shoulders is unnecessary. It will be sufficient to slack the traces, to examine the shoulders for abrasions, and then to moisten the bearing surface with a wet sponge. The subsequent evaporation will keep the shoulders cool. The mane should be roached.

On the march, the battery commander should frequently let his battery pass by in order to make a close inspection and to correct faults. Contrivances to neutralize the weight of the pole on the neck are expensive and in the way. The same thing can be accomplished by furnishing a strap back-rest for the cannoneers on the limber. Horses should be watered in an orderly manner. The removal of bridles is not necessary. Horses can drink just as well in a snaffle bit. Horses should not be given cold or muddy water, nor permitted to stand for any length of time in cold water when in a heated condition. This brings on laminitis. Watering from buckets is frequently advisable. Before the battery itself reaches camp, all the preliminary arrangements should have been completed so that the organization will line up promptly, halt and melt away on the lines. Girths are loosened but saddles not removed for ten minutes. After this the dry side of the blanket is placed next to the surface of the back and held in place by a surcingle until the back has recovered its tone. The bearing surfaces of blankets should not be dried in the sun. This makes the surface hard and brittle, and is injurious to the back. The shoulders are now washed off, collars cleaned and harness cleaned and softened. All animals are then inspected for abrasions, galls and shoeing.

If camp is reached about noon, animals

should be first watered and then given a mid-day feed of oats and three pounds of hay. Care must be taken to remove nosebags as soon as emptied. On the road, avoid all public watering troughs and hitching posts. In camp also avoid vacant stalls. Grooming, watering and feeding take place later in the afternoon. In warm weather, horses should be watered again about 7:00 p. m. in order to permit the horse to properly masticate and insalivate his feed. Horses do not drink well early in the morning; therefore, watering should take place at the first opportunity on the road.

When subjected to extreme exertions for protracted periods, horses rapidly lose flesh, necessitating a readjustment of harness. A rest should always be taken on Sundays. No horse should start on a march unless he is absolutely fit.

A battery should be ready to leave camp at 6:00 a. m. To do so, it will be necessary to have reveille about 4:45 a. m. Thirty minutes must be allowed for feeding. No harnessing or saddling should be permitted until 20 minutes before the time for starting. Strict supervision is necessary to enforce this rule. On wet or windy days hay must be conserved by feeding it in installments because horses will refuse to eat wet hay and on windy days much of the hay is blown away and then trampled under foot. Strict supervision of the feeding, especially for the morning distribution of oats, is absolutely necessary to insure that every horse is getting his proper allowance of grain. The alarming loss of flesh so often noticed on marches is usually due to hurry in the morning feeding. An officer should, therefore, always be present.

**—Horses—Draft**

[In the Collar. By Vet. G. E. Griffin, 3d F. A. *Field Artill. Jour.*, July-Sept, '15. 5200 words.]

The good field artilleryman must be a horseman, and must be able to reach the position with his battery in time to deliver an effective fire. The knowledge of horse conservation and management in militia batteries is very poor, due principally to the insufficient periods of training. It is claimed, though, that with a nucleus of good n.c.o. specialists and trained horses, a good battery ready for active service can be produced from raw material in six months. The field artilleryman must resist the temptation to choose saddle type horses for draft purposes. The best draft horse is a cross of the Percheron on our well known light harness type. The requirements are: Height, 15.3 to 16.2; weight, 1200 to 1300 lbs.; age, 6 to 12; mare or gelding; good conformation for draft purposes; sound in wind, limb, vision, heart and digestion; clean gaits; and endurance in the collar. In supplying such horses, the remount system is much better than the contract system. A system should be adopted whereby all draft horses in the vicinity of a battery's station are registered for service. This scheme was adopted by the British after the South African war.



Militia batteries will soon have ten or more horses each for instruction purposes. To inculcate good horsemanship, regular officers who are horsemen should be detailed to give instruction and talks on riding, forage, care of stable and picket lines, feeding, watering and grooming, shoeing and fitting of harness, sanitation and veterinary police, endurance and draft both in garrison and field.

The breast strap should be substituted for the present collar, the adjustment of which is very difficult. The failure to water horses at night is the cause of nearly all intestinal troubles. Salt in the feed is not as necessary as some persons imagine. Bran has very little nutritive value and serves principally as a laxative. There should be a variety in feeds, but new feeds should be substituted gradually.

The only way to maintain good condition in a horse is by a regular course of graduated exercise in draft. Grooming is very invigorating; washing the legs and body is dangerous. Clipping helps condition if the animal is properly clothed and cared for. The secret of good military shoeing consists in non-interference with the sole and frog, combined with a good bearing surface for the wall.

General precautions are: Steer clear of public watering places or stables; always disinfect and examine horse-cars for shipping; never ship a horse while harnessed; in handling a horse be gentle and patient; in training be firm, calm, fearless and patient; teach a young horse one thing at a time. Be satisfied with a small amount of progress, and be very sparing of whip and spur.

*See also*

FIELD ARTILLERY—HEAVY—DRAFT

—Horses—Harness and Equipment

*See*

HARNESS—FIELD ARTILLERY

—Horses—Instruction and Training

[Breaking Artillery Horses. By Capt. W. P. Ennis, F. A. *Field Artillery Jour.* Oct.-Dec., '15. 4200 words, illus.]

The organization of additional batteries will necessitate the quick breaking and training of horses for field artillery draft. The following method which has been successfully put into practice is proposed.

The horses are first equipped with a halter and a neck-rope which is passed through the chin strap of the halter. The rope trails on the ground. All the horses are then turned loose in a corral for 24 hours, where by stepping upon each other's halter ropes they halter break themselves. The next day the horse is tied with the halter to an unyielding object. He is then gently by careful handling. If a horse refuses to lead, a loop is thrown over his croup. Every time the horse refuses to lead with the halter, this rope is pulled. The feet are then handled and picked up. For the mounting exercises, the horse is first securely snubbed to an immovable object about 5 ft. high. At first the trainer mounts gradually, later he leaps up all the way. The bit should never be forced into the horse's mouth, nor should the ears be handled roughly. When in-

serting the bit for the first time, a handful of oats will usually induce the horse to open his mouth. As soon as a horse goes well at a walk, he should again be snubbed for saddling. This is done gradually, blanket first, then put on the saddle, fasten the girths loosely, rub the stirrups along the horse's sides until no fear is shown. Next harness, first snubbing the horse again and if necessary using the Scotch hobble. First raise the tail and place the crupper in position. In putting on the collar, have an assistant. The collar should first be gently rubbed against the horse's neck and then closed and locked, after which it should be fastened by the collar strap. Failure to do this carefully, someone always holding on to the collar until it is securely fastened, may frighten the horse so badly as to make him afraid of the collar ever after. Always keep the horse securely snubbed during all these operations. The traces are put on last.

In training for team work, break the wheelers first with the driving reins, using a field wagon. A rope passes from the driver's hands to one of the front feet. This leg rope is used in case the horse misbehaves. The gentlest horse is then used under the saddle. Next hitch in the leaders, placing the gentlest on the near side. The swing pair are put in last. No whipping of any kind or rough handling should be tolerated. Never permit a young horse to lunge into the collar. Let all horses walk along and gradually find their proper leaning into the collar. When all the horses work in the team, they are taught to pull by gradually putting on the brakes of the carriages. Care must be taken not to overload or to stall the team or else balkers will be developed. The horses are not trained to neck-rein until they respond to the leg and rein aids in turning on the forehand. Backing is the next step in training. In all training, as soon as the horse makes any required move, the application of the aids should be stopped at once and the animal rewarded.

Recruits are taught to ride by mounting them on the gentlest horses with the reins fastened in the halter squares. A corral may be improvised with carriages. With a few experienced men it is believed that a battery can be taught to take the road in a month. Cold shouldered horses will pull when once started. Balky horses that throw themselves and quit should be given the water cure. No punishment with the whip should be used. (A method of using and applying the Scotch hobble is also described.) This hobble is used to get control of one hind foot, keeping it off the ground. The use of the long reins to make a horse bridle-wise and to teach him to go forward, to back and so forth is also well recommended.

Among the harmful methods mentioned are twitches, stocks, cutting manes, tails and forelocks, use of whips and spurs on new horses. Always keep the horses straight in the collar and give them their heads on a stiff pull.

—Instruction and Training

[Service of Artillery. By Jose Neira, 2d

**FIELD ARTILLERY—Continued**

Lieutenant, Chilean Army. *Mem. Estado Mayor* (Colombia), Jan-Feb, '16. 2700 words.]

Of all the branches of the service, the subaltern commanding a platoon of artillery in the firing line occupies the most important, the most delicate, and the most responsible position. He must not only regulate the fire of two guns, subjected to hostile fire, but must keep up the morale of the men, who see the dangers to which they are exposed, and whose only thought is of the time when they may be struck by the hostile projectiles.

***Duties to be performed by platoon commanders***

Immediately upon entering the firing position, he should (1) inspect the position to be occupied by his platoon and make a reconnaissance of the field of fire and of the target assigned to each gun. In the case of indirect laying, he should study the conditions presented by the intervening obstacle. (2) See that all instruments are properly adjusted and all preparations incident to firing have been properly carried out. (3) Take the necessary steps to shelter the personnel, ammunition, and matériel (this will depend on the time available).

During the fire for adjustment, the platoon commander should observe the target and the ground in the immediate vicinity, following up every detail in order to notify the battery commander of the changes necessary and of the appearance of other targets. Under no circumstances must he relax the observation of the enemy appearing in his direction. Also, the platoon commander should watch the fire distribution and, if possible, assign the target sector to be covered by each gun.

He should correct any mistakes in the commands, signals, or corrections given by the battery commander, and then report his action. To do this, the chief of platoon must be thoroughly familiar with all commands and signals of the battery commander. The commands given by the battery commander should be repeated in the same order, with equal precision, and loud enough to be heard by all the personnel of the platoon, the chief of the adjoining platoon, and the battery commander when the latter is directing by word of mouth, or by the telephone men when the battery commander is some distance away.

Once the firing has commenced, the principal rôle of the platoon commander is that of maintaining within his unit a strict fire discipline; for this purpose, he may remain at the guns, with the caissons, or in a trench. He should not undertake to make any corrections for points of burst. Observations made should be reported to the battery commander.

The spirit of initiative should be practiced. Inaction or loss of time is a graver fault than an error in the selection of the means.

Fire distribution is the foremost duty of the platoon commander; his attention should be concentrated on this one point. During the fire for adjustment, he should observe and determine the sectors to be covered, plan ahead for the measures to be taken in view

of the target presented and of the special situation.

The chief of platoon should possess initiative and be well informed in all the details of matériel, personnel, regulations, etc., in order to replace the battery commander at any time without reducing the efficiency of the organization. He should also remember that he has the sacred mission of co-operating with the battery commander, so that the latter may obtain the best results possible from the work of the battery. Finally, never to abandon his guns, whatever may be the cost, even to the extent of sacrificing himself and the entire personnel under his command.

[The Principles of Scientific Management and Their Application of the Instruction and Training of Field Artillery. By Lieut. W. E. Dunn, 3d F. A. *Field Artillery Jour.*, Apr-June, '16. 21,000 words.]

It is intended to study the principles of scientific management or industrial efficiency and investigate their application to military efficiency. Both armies and industries depend upon organized human labor, trained and directed to accomplish tasks. The common sense of efficiency is to prevent all kinds of waste; waste of time by planning and coordinating work; waste of property by inspection and supervision; waste of labor and energy by selecting workmen best suited for each kind of work and then training them to perform it in the best way. The determination of this best way has enabled scientific management to revolutionize modern industry. It accomplishes this by instituting accurate investigations; making observations on time, motions, causes, etc.; collecting these data and then analyzing them so as to disclose the waste and inefficiency as well as their causes. From this analysis and study, standard methods are determined together with the best working conditions, plant, equipment, shop arrangement, tools, materials to be used. Schedules and instruction cards are then made out which give the person to whom the work is entrusted the necessary directions and the order of the operations. They tell him what to do, how to do it, how long it should take, or whom to call for assistance, to whom to report the completion of the job. The schedules for routing the work are made by the planning department, and provide that the proper materials are on hand, that the work is routed thru its different steps without loss of time, and all departments are so co-ordinated, that the work is finished on schedule time. Teaching and training are necessary features of industrial efficiency as well as of military efficiency. Teaching uses and trains the senses. It stimulates attention. Real teaching should be a mental training. In most teaching only the memory is exercised. This is insufficient. Habit is the greatest labor-saving device. Health and welfare are also closely related to their output of work.

A system of inspection is necessary to insure the proper and efficient conduct of any enterprise. It holds every one to his responsi-

bilities; it upholds the standard; it guards against waste; it insures that the original plans are efficiently executed. It should not be necessary to resort frequently to measures of discipline. Executive ability in the control of men avoids much of the necessity of administering discipline if the occasions and causes which require discipline be forestalled. Interest, loyalty, and whole-hearted enthusiasm make for efficiency. Baser feelings should never be aroused; nobler feelings should be fostered. Human nature is full of energy and it should be stimulated by scientific control and direction. Whenever punishment is administered, it should be accomplished impartially and without exhibition of personal anger or vexation. It certainly should be unquestioned. Nevertheless, a resort to disciplinary measures is in itself an admission that discipline is lost or lacking.

All the above principles in scientific management and industrial efficiency can be applied to the instruction, training and preparation of field artillery for its proper functions. The subject of field artillery must be studied in the same way and standard methods of instruction and training thus evolved. *Thorough training of the individual soldier is the basis of efficiency.* Habits must be formed so that the soldier will perform his duties when under excitement almost as a matter of second nature. *Develop self-reliance and initiative!* Therefore, be careful in making criticisms, especially upon matters of judgment. Place reliance in subordinates, but train them for their duties. Make your officers assume responsibilities and believe in themselves.

Schools should be organized as follows:

1. A school for all newly commissioned second lieutenants.
2. A school of fire for all officers above this grade.
3. A mechanical and electrical school.
4. Officers should be sent to the Army Service Schools for tactical instruction.
5. A regimental school for officers, taking up artillery tactics, conduct of fire, etc.
6. Regimental conferences at stated occasions for discussion and interchange of professional ideas.
7. Instruction of battery officers. The battery commander should divide the work in the battery into separate departments, placing an officer in charge and by holding him responsible for the results attained, encourage him to use his thought and effort in his chosen profession.
8. Instruction of N. C. O.'s. If possible, this instruction should be regimental. These men should be carefully chosen and carefully trained, so that they will not only be fitted to perform their duties in the battery, but will also be absolutely familiar with the methods and goal of instruction, thus making them more efficient instructors. When given a group of recruits, every one should be engaged in work and no one should be standing idle.

The method of instruction and the course of lessons must be carefully and scientifically planned. The general principle of the method

of instruction is to teach by sense impressions, actual manipulation and use of sight and hearing in aiding the memory. The general principle of time is to have short periods of instruction. In teaching it is always necessary to fix attention and then to hold it. The instructor must never let the lesson grow monotonous or lag. The instructor's attitude must be plainly helpful. In planning the course, a clear idea must be had of the subject, the methods to be used, the number of lessons and their length, the standard of proficiency, etc. Training always follows instruction; after a man is instructed in a particular duty, he must be trained in it until he is expert. Recruit training is largely individual. Later, group or squad training is undertaken. He does not perform his regular duties until he is turned in for duty with the battery.

To insure proper control and progress in instruction, well understood standards of proficiency at the ends of stated periods must be fixed. Nothing should be left to chance. Records should be kept because they will furnish the statistics for future analysis and improvement in methods and instruction.

Schedules should be carefully and thoughtfully prepared. They mean co-ordination of effort and elimination of waste of time. The schedule should fix the subjects of instruction; the amount of time; just when the subjects can be most profitably undertaken; what subjects come first; how much should be attempted each day; the sequence of lessons. A n.c.o. in charge of any group should have his instruction card which will give the time for the special task, the men assigned, place, matériel to be used, each class of work, what report is to be made, and where the group will be sent when dismissed. When such a system is adopted, the discipline in an organization will improve because of the orderly way of doing work and its definiteness.

To get the most efficient service from our men, their health must be preserved. To keep men contented, do not leave them in idleness without money and with nothing to do. When their work is over, make them comfortable. Provide wholesome recreation and amusement as well as good wholesome food.

We have a form of organization in the field artillery which will work in the main, but there are many features which can be improved by a change in the system under which we work. The most important changes recommended are:

1. A radical change in our system of inspections.
2. Inspection tests should be real tests of efficiency, of preparedness for war.
3. Inspections in the nature of supervision of work and of results should insure efficiency thruout the work.
4. In administration, all our work should be planned. This can be done by the personnel of headquarters and staff. The schedule should then be carried out by the battalion and battery officers.
5. System of records should be kept for use

**FIELD ARTILLERY—Continued**

and analysis to promote efficiency.

6. All work, instruction, training and methods should be standardized. At present only our material is standardized.

7. The system of promotion of both men and officers should be designed to promote and secure efficiency.

8. Our system of discipline should be positive in character, designed to secure the desired results thru correct use of psychology, incentives and personality rather than punishment.

*See also*

FIELD ARTILLERY—HORSES—INSTRUCTION  
AND TRAINING

FIELD ARTILLERY—TACTICAL HANDLING OF  
*Chile*

[School of Fire for Field Artillery. By Captain Carlos Saez, M. *Mem. Del Ejército* (Chile), July, '16. 1300 words.]

(A plea for the establishment of a school of fire for the Chilean artillery.)

The field and not the barracks is the logical place to carry on the tactical training and instruction of the artillery personnel. Results cannot be obtained with just good intentions. Continuous target practice, problems carefully prepared and the results studied are an absolute necessity.

Unless the exercises are along the lines of tactical problems, how can we expect a captain to be thoroly conversant with the details of firing his battery in accordance with the tactical requirements of the other branches of the service? and with the fact that the selection of the position and preliminary firing are the result of a logical tactical situation?

This can only be learned at a School of Fire, and while at first such an institution will not be up to the standard of the European schools, let us institute something less perfect, but at the same time practical.

*France*

[Late Notes on French Artillery. Editorial. *Field Artill. Jour.*, July-Sept, '15. 500 words.]

The trot is the usual gait, the walk the exception. On the march, ten minute halts are made in every hour; all carriages close up on the right hand side of the road, whereupon all mounted men dismount. The French try to have at least one officer with the firing battery, but seldom have two. The Barr & Stroud range finder was issued just before the beginning of the war. In firing, the French are satisfied with a rough adjustment and then deliver fire for effect with apparent disregard of the supply of ammunition. Batteries are always well masked, and the position in observation is constantly used. All tactical handling is by battalion.

*Great Britain*

[A Battery on the March. By Major W. F. Blaker, R. F. A. *Jour. Royal Artillery*, Jan, '16. 6000 words.]

These notes have been compiled in the hope they may be a help to many young officers

and n. c. o.'s daily joining in different parts of the world.

*Pace.*

Batteries marching with other troops must conform to the pace of the column, but for batteries marching alone "the fastest possible walk and the slowest possible trot" is the golden rule.

The battery commander is responsible for the pace, and he should be at the head of the column when tactical considerations are not involved.

All marches should begin with a short walk of a mile or two to remove stiffness gradually, and the walk should be followed by a short trot before the first halt is ordered.

When starting a trot it is important to begin very slowly so that all may get quietly and smoothly into their stride. The pace of the trot should be a hunting jog.

No rule can be laid down as to when the first halt should be made, from 20 to 30 minutes after starting probably will be best. During this halt, girths and breechings should be adjusted and every foot examined to see whether stones have been picked up. After the first halt, walk and trot will alternate according to temperature, the condition of the roads, and their gradients. When there are many ups and downs, the length of the column will seriously affect its pace aside from the fatigue, and the officer who wishes to keep his command together must remember the length of the column when ordering change of pace.

*Length of marches.*

The average length of march for a large column of all arms is 15 miles a day, but a small command may cover 25 miles. Animals should be conditioned gradually for a march. The forage ration should be increased gradually from minimum to maximum in preparing for a long march. It is a great mistake to make this increase suddenly or just before starting.

On long Indian or African marches over unknown roads, it is desirable to keep a private diary or route book.

*The rule of the road.*

In whatever country you are, stick to the rule of the road. In France and Germany it is keep to the right, but in the United Kingdom, to the left. Horse-drawn vehicles must invariably give way to mechanical transport and leave the center of the road to motor cars and lorries. In drawing up by the roadside always leave crossroads clear.

*Passing of orders.*

No trumpet or bugle call is allowed on the march, the column being directed by signal (*Field Service Regs.*, Part I, page 47). Artillery at the trot cannot pull up in six inches, and men cannot be on the lookout for silent signals. Therefore the rapid passing of orders up and down the column should be practiced frequently. In passing orders from the front, men should turn well round in their saddles, repeat the order clearly, and see that it is acknowledged.

### Supervision.

The battery commander is responsible for the supervision of the whole, and under him each chief for his own command. At intervals during the march the battery commander should hand over the lead to someone else, fall out, and let his battery pass him. He thus inspects it. He may rest content with the pace if the last team is sweating no more than is the first.

Every horse should do his full share of work at all times, and wheel and center drivers should cover exactly the lead driver to avoid trace galls. Slovenly riding must be checked at once, and gunners riding on the vehicles should sit upright. Up to the first halt, all ranks should march at "attention," thereafter "at ease" except through towns.

On a long, gentle slope, it is sound to trot down, but on steep slopes the brakes should be applied so that the wheels revolve slowly and the pole remains horizontal.

A vehicle that falls out of the column in case of a breakdown must fall in at the tail until the next halt. Its space in the column is not filled. The correct maintenance of distances should be insisted upon, especially that between carriages. Distances once lost should not be made up by jig-jogging but may be corrected at the next halt.

### Halts.

After the initial halt, halts of from five to ten minutes should be made every hour. These afford rest and an opportunity to examine animals and adjust harness.

Whenever a halt is ordered, the brakes should be put on and someone should remain at the horses' heads. The poles should not be let down unless the wheelers be unhooked from the carriage.

During long marches in peace time, one day each week should be set apart for rest. The rest day should be utilized to clean and air all nosebags and to overhaul carefully all equipment.

### Compliments.

No compliments are to be paid on a march on service, but the customs of a country should be respected. It does no harm to give to native dignitaries the attentions and small honors to which custom entitles them. Miss no opportunity of seeing other batteries and mounted organizations.

### United States

[Battery Administration and the Duty of Lieutenants. By Capt. W. Bryan, F. A. *Field Artill. Jour.*, July-Sept., '15. 9000 words.]

(NOTE.—This is a very thorough discussion and classification of the method of performing the routine work in a 6-inch howitzer battery. The article includes many schedules of work and models of records. The classification of the work may be applied to any battery, and, with obvious modifications, to any organization of the other branches.)

Many battery commanders do not use to the best advantage the officers and n. c. o.'s given them as assistants. There is much routine

work about a battery, and unless the work is systematized, time and labor will be wasted and opportunities for instruction lost.

The work of a battery is outlined with departments for four lieutenants and the first sergeant, and an outline of the administrative duties of the B. C. is given. Lieutenants are changed every three months in order to make them conversant with all the duties.

(a) *Care of animals and their equipment.*—One lieutenant is in charge, assisted by the first sergeant, the stable sergeant, stable orderlies, horseshoers and blacksmiths, chiefs of section and drivers, and extra cannoneers.

*Duties.*—Grooming, feeding, and watering animals; care and police of stables and picket line; charge of dispensary and care of sick horses; horseshoer's shop and work; condition, care, and repair of harness and horse equipment in use and in storage; transportation; records and care of public animals; and preparedness of all transportation to take the field.

(b) *Care of matériel.*—One lieutenant in charge, with the chief mechanic as principal assistant, and assisted by the gunners, caisson corporals, and the necessary cannoneers.

*Duties.*—The lieutenant has charge of all ordnance property and must have a thorough knowledge of all matériel and actual work with his men. Guns are machines and must be handled as such. The chief mechanic controls and supervises work of the mechanics, and is given authority over the gunners. He is the executive of the officer in charge in properly caring for the matériel, and supervises a comprehensive cleaning schedule. This schedule comprises the duties in daily cleaning both before leaving park and after returning to park; special cleaning which is to be completed every two weeks and every three months by the gun detachments; and special cleaning to be completed by the chief mechanic and his assistant mechanics. A record is kept in a field book belonging to the chief mechanic. By this method, the regular Friday cleaning is abolished. All shops, with the exception of the horseshoer's shop, are under the supervision of this officer.

(c) *Care of Quartermaster's property, battery records and personal equipment.*—A lieutenant in charge, assisted by the quartermaster sergeant.

*Duties.*—Charge of memorandum receipts; all issues and storage of property; all paper work and property records; serviceability of property; proper allowance of camp equipage and property on hand to take the field. The quartermaster sergeant has direct charge of all storerooms, the battery and store wagons, and general repairs. He is the custodian of all property records and papers, and prepares equipment lists for all units of the battery.

(d) *Care of the mess.*—One lieutenant in charge, assisted by the mess sergeant and cooks.

*Duties.*—Supervises the mess and checks the accounts and supplies of the mess sergeant.

(e) *Police and discipline.*—The captain in charge, assisted by the first sergeant.

*Duties.*—The first sergeant should not be

**FIELD ARTILLERY—Continued**

bothered with paper work outside of the necessary rosters which he keeps.

In managing a department, the following points should be observed: in taking over a new department, study its details and workings first, and make no radical changes without the battery commander's consent; have everything always ready either to take the field, to change station, or for an inspection; the system of operation must be simple and adapted to be continued without change either in the field or garrison; affairs must be left in such condition at the end of each day that the department can be turned over without confusion or delay to a successor; the principal enlisted assistant must be so intimately acquainted with the work and the scheme of management that he can take charge in an emergency.

Every lieutenant must learn the details of his job, arouse interest in his subordinates, and encourage initiative.

The battery commander supervises all this work, and must direct it and give hearty support. His principal work consists in planning drill and instruction; attending to official correspondence; good order and measures of discipline; and other duties of such importance that they cannot be delegated to an assistant. But he must always inquire into the work and methods of all departments, and by unexpected inspections determine that his ideas are being carried out and that the work is being properly performed. His policy must be one of non-interference unless he becomes aware of inefficiency in existing methods, or desires the work performed in a specified manner. Only in this way will initiative be aroused and good results attained.

This scheme has been tried, and it has given excellent results. It also prepares the lieutenants in their duties as future battery commanders, and, above all, fixes responsibility by that best of all teachers—*experience*.

[The Firing Battery. By 1st Lt. H. Pfeil, 1st F.A. *Field Artill. Jour.*, July-Sept, '15. 5200 words.]

These notes present practical observations during two summer firing practices with a battalion of field artillery at Tobyhanna, Pa.

The gun squad will not work as a unit and show team work until each individual cannoneer has thoroughly mastered his individual duties. The gunner should be instructed to actually lay the piece before teaching him to set the sights. After each shot, he must bring his line of sight back to the original point, being careful to take up all lost motion in the material. It is not necessary to teach cannoneer No. 1 the function of the quadrant. All that is necessary is that he be able to set his quadrant and lay the gun accurately every time, speed being second in importance. He also must take up all lost motion. No. 2 must be taught to shift the trail rapidly and accurately by a graduated scale painted along the top of the shield. He should be a strong man. The duties of No. 3 are purely mechani-

cal, but must be performed with rapidity. No. 4, who sets the fuse, must acquire dexterity and accuracy by constant practice. No. 5 assists No. 4 and must acquire great celerity of movement. These two men should be interchangeable.

The principal duties of the chief of section are to supervise the gun squad, to assist the gunner, and to keep a record of all firing data.

The duties of the executive officer are not clearly defined in regulations. He supervises the emplacement of the guns in the selected position, and sees to it that the battery is prepared to deliver fire according to the data sent by the B. C. He keeps a record of all data sent down, and in direct fire regulates the distribution. When a gun fails to fire in its proper turn, he causes another gun to fire and at once notifies the B. C. He should be a man of few words, giving commands only when absolutely necessary, and keeping an eye on the battery in general to see that all parts of the machine called the firing battery are working smoothly. In instruction, short snappy drills produce better results than monotonous and protracted periods of work.

[Competitive Figure of Merit for Field Artillery. By Capt. Clarence Deems, Jr., 6th F. A. *Field Artillery Jour.* Oct.-Dec., '15. 13,000 words.]

A means is suggested of comparison between batteries in order to secure a measure of their relative battle efficiency. The value of a battery or any other field artillery unit is based upon its marching capacity and its shooting ability. In the past some effort has been made by inspectors to grade battalions, but no attempt has so far been made to grade batteries. The trouble is that the present system is not comprehensive enough, and that therefore no results of permanent value are obtained. To grade by battalion alone is not giving the credit or discredit where it rightfully belongs. Moreover, we fail to cultivate *esprit* which is more apt to be stronger in a battery than in a battalion. The scheme proposed is a system of comparative merit for batteries, battalions, and regiments armed with the same matériel. The grading should be effected by considering the offensive value of the fire, the unit's defensive ability, and its marching capacity.

A method is then discussed for grading the batteries according to their offensive value in fire action. Under this head are considered the systems of grading in the coast artillery and infantry, objections usually offered to any system of grading, etc. It is proposed to give each battery 48 rounds for one problem involving some firing for effect. The battalion commander is also given 24 rounds per battery with a suggestion requiring him to range one of his batteries. The figure of merit of the higher units is determined by taking the average figure of merit of the three batteries, adding to it the figure of merit of the battalion commander, and dividing the result by two. A similar method is followed

for the regimental figure of merit. Battle conditions are not introduced, because they are so variable that it would not furnish a uniform standard for comparison. Under the firing, the methods of ranging and the number of salvos are considered. A method is then proposed for the calculation of the time element and the number of hits. By using certain proposed equations, the figure of merit or efficiency is arrived at.

A marching test is then outlined, suggesting penalties for particular deficiencies. Visibility of the target should also count in the relative grading. Proficiency in pistol practice as an organization is also counted in the final figure of merit. The value assigned to an organization for its final mark of efficiency would then be the total of the points in artillery firing, those in pistol practice, and in the marching test.

[Smoke Bomb or Flash Practice. By Capt. Wm. Bryden, F.A. *Field Artillery Jour.*, June, '16. 6000 words. Illus.]

(Note. This is a detailed description of smoke bomb and flash practice as conducted at the School of Fire for F. A. at Ft. Sill, Okla., during a four months' course of instruction for the officers of the Regular Army. Its purpose is to assist instructors after they leave the school, and to stimulate interest in this practice thruout the service.)

Smoke bomb or flash practice consists in representing shrapnel bursts in the vicinity of a target at artillery range from an observation point, the position of the bursts being varied in accordance with the commands given by the person conducting the fire and with these firing data assumed as correct by the operator at the target. The objects of the instruction are to develop the powers of observation and to drill officers in manipulating all the elements of adjustment. Officers are first trained in handling the deflection and distribution only, all bursts being shown low and short of the target. The operators at the target produce all sorts of errors which the observer must correct by the appropriate commands. After two weeks of this training, a qualification test is given. To qualify, no interval between the last burst of any salvo and the announcement by the conductor of the proper correction for the next salvo shall be more than four seconds.

After this the handling of the corrector is taken up by varying the heights of burst in addition to deflection and distribution changes. The next step is the variation in the range. All errors previously indicated are shown, and in addition variations made in the range; the conductor is required to get an appropriate bracket on the target with all the elements of fire properly adjusted. Complete records are kept. The B. C. is required to announce his observations in flash practice, which is not required in service practice. Flash practice is held daily until the commencement of service practice.

Service targets are used. Ordinarily flash practice is preceded by instruction in recon-

naissance and identification of targets. The direction of each target is noted by the observer who, by a sketch, records on a blank the angular distance in miles from the right visible element of the target to the designated reference point. Ten to fifteen targets are usually set out.

The flashes at the targets are operated by a detail consisting of one officer or n.c.o. in charge who announces changes and gives commands for firing flashes; one n.c.o. as recorder and as assistant to the n.c.o. in charge; ten privates called flash men, five in front and five in rear of the targets; two powder men who distribute powder and assist the flash men in the operation of the flash apparatus. In addition, there are required two telephone operators, one at each end of the line.

Flashes are shown as grazes by a special contrivance; or as zero, low or normal bursts by using a flash cup attached to a staff which is held close to the ground, raised half or all the way; or as high bursts by using flash cups attached to a trolley strung over two high poles.

(The article gives an accurate description of the apparatus, its manipulation, as well as a detailed description of the methods of instruction. The illustrations accompanying the article, together with an example which describes every command and operation of every individual, make it easy for any one not acquainted with this practice to understand and to follow it easily.—Ed.)

[Group Instruction in the Horse Artillery. By Col. Vernengo. *Revista Militar*, July, '16. 4300 words. 4 diagrams.]

(This article describes a series of tactical exercises in which applicatory methods are used for training horse artillery groups.)

#### —Instruction and Training—Militia

[Improvements in Sub-Caliber Cartridge. By Col. G. A. Wingate, 2d F. A., N. G. N. Y. *Field Artillery Jour.*, Jan-Mar, '16. 1000 words.]

Description of a device for sub-caliber practice which permits the setting of fuses on the drill cartridge and the use of spotlight cartridges facilitating observation of points of impact. The device consists of a 3-inch gun drill cartridge in which is inserted the barrel of a gallery practice rifle, .22 caliber. The total cost of alterations and material to produce the device is \$13.73.

[Examinations for Officers of the National Guard Field Artillery. By Maj. H. M. Bush, O.N.G. *Field Artillery Jour.*, Apr-June, '16. 3000 words.]

Under the new law provision is made for the examination of National Guard officers to be conducted by a board consisting of three officers appointed by the Secretary of War from the Regular Army or the National Guard or both.

Based upon the examination which the War Department has required of officers for volun-

**FIELD ARTILLERY—Continued**

teer commissions, the scope of the examination for militia officers is discussed and a course of instruction outlined. This includes an elementary examination which may be waived if a diploma or certificate from a qualified school or college can be presented; and a professional examination in the following subjects: Administration, Field Artillery Drill Regulations, Field Service Regulations, Small Arms Firing Manual, Manual of Guard Duty, Military Law, Topography, Tables of Organization, Hippology, Field Artillery Matériel, a test in equitation and knowledge of saddle equipment. To these should be added: First Aid and Hygiene, Examination of Recruits, Signaling and Telephones, Gunners' Test.

**—Matériel**

See also

**FIELD ARTILLERY—FIRE—ACCIDENTS IN  
Great Britain**

[The English Field Howitzer. Editorial. *Artill. Monatshefte*, July-Aug, '15. 1800 words.]

(NOTE.—This is a description of this howitzer as given in the official "Handbook of the 4.5-in. Q. F. Howitzer. Land Service, London, 1914," and is too technical to be abstracted.)

In construction it resembles all modern quick-firing guns. The recoil is variable. Both shrapnel and shell are fired. Four zones are used.

Weight of howitzer and breech block, 1075 lbs.  
Length of tube .....71 in.  
Caliber .....4.5 in.  
Initial velocity .....1025 f-s  
Maximum range .....7100 yds.  
Weight of gun, carriage and limber..2475 lbs.  
Weight of ammunition wagon.....4543 lbs.

**United States**

[Facts as to Foreign Ordnance. *Army and Navy Jour.*, Jan 29, '16. 600 words.]

(From Col. Treat's evidence before the Senate Military Committee.) The U. S. 3-inch field gun is superior to any foreign field gun except the French "75," which is superior in its recoil mechanism. Ordnance experts are working to perfect our gun in this respect. The new 16-inch field howitzers require no platforms, are transported as three tractor loads over roads such as those in the interior of our own country, and can be assembled for firing in an hour and a half.

The French have lost 400 guns and crews from high explosive shell exploding prematurely in the guns. These shell carry about four times the explosive charge of our own shells. We are experimenting to reach this efficiency without the danger.

We are recommending that 50% of the artillery be 3-inch, which has a percussion range of about 10,000 yards. 10% shrapnel and 90% shell will be provided. The 3.8-inch howitzer will pair with the 3-inch gun for high angle fire. The next pair recommended is the 4.7-inch gun and the 6-inch howitzer, range 14,000 yards, motor traction. These guns are being

tested. A 7.6-inch howitzer has been built and is recommended for adoption. A 9.5-inch howitzer is being designed and hope is entertained that a 16-inch howitzer will be authorized.

Five field guns per 1000 rifles are recommended. Germany had more than six to begin with. An ammunition company, all caissons, is also recommended.

[Our Deficiency in Artillery. *Army and Navy Jour.*, Feb 5, '16. 500 words.]

Before the Senate Military Committee, the Chief of Ordnance stated that we were short over 1000 of the 2000 machine guns required on a basis of five to a regiment of cavalry and infantry. The German army began the war with 16 machine guns to a regiment twice as large as our regiments, and the number is reported to have been increased to 48 per regiment.

We have, built and building, 225 batteries of field artillery of four guns each, enough for 200,000 men upon a basis of 4.9 guns per 1000 as contrasted with the German proportion of 6 per 1000. There are no guns for any reserve or new troops.

The quantity of field artillery ammunition on hand (700 rounds per gun) is scarcely enough for a week's fighting. Advantage should be taken of the fact that our manufacturers are now in a position to produce war materials. It would cost the government \$50,000,000 to put itself on a self-supplying basis.

[Changes in F. A. Equipment. Editorial. *Field Artillery Jour.*, Jan-Mar, '16. 200 words.]

Two batteries of the 5th Field Artillery are to transfer their horses and equipment to the 4th Field Artillery, in which regiment a howitzer battalion of 3.8 and 4.7 howitzers will be organized. The two batteries of the 5th Field Artillery will be provided with motor tractors and trucks and equipped as heavy motor batteries. The matériel for a 4.7 gun battalion will be shipped to Honolulu to be used by the 1st Field Artillery as supplementary to their present 3-inch matériel. The last remaining battalion of mountain artillery in the U. S. will be sent to Panama.

See also

**FIELD ARTILLERY—HEAVY—UNITED STATES  
—Matériel—Small Velocity Ordnance**

[A Gasoline Gun. *Army and Navy Jour.*, Jan 8, '16. 300 words.]

With nitrates short and powder running low, a gasoline gun has been invented for the short range bomb-throwing work. Hundreds of them are now in use.

**Great Britain**

[The War on Land. By a Military Officer. *The Army and Navy Gazette*, Nov 27, '15. 1500 words.]

As far as trench fighting goes, our army is becoming daily more fully equipped, and the supply of machine guns is quite adequate.



In one portion of our front recently attacked, we had one machine gun to every ten yards of trench. The attack was checked dead with no loss to ourselves. The supply of an efficient trench mortar has commenced. Formerly our trench mortar fired a small shell and was inaccurate. Now it throws a huge shell a considerable distance with great accuracy, and we are on equal terms with our enemy although apparently they have lately been using a trench mortar firing a 100-lb. shell.

#### —Matériel—Recoil Mechanism

[Foreign Notes. England. Brake and Spring Recuperator of the Field Gun. *Mem. de Artilleria* (Spain), Jan, '16. 300 words. 1 illus.]

The piston is stationary, the cylinder moving to the rear of the gun. The free end of the piston rod is hollow to receive a counter-recoil buffer of the plunger type. Two concentric spring columns are provided. These work in series to return the gun into battery.

#### —Motor Transport

[Test of Motor Traction for Heavy Field Artillery. Editorial. *Field Artill. Jour.*, July-Sept, '15. 2000 words.]

The trucks tested were the Jeffery and the Duplex. Both have four wheel drive. In the Jeffery the four wheels are also guide wheels. Three tests were prescribed. (a) Efficiency in ammunition supply; (b) efficiency in traction of elements of the firing battery; (c) efficiency on marches. During all tests an accurate record was kept of mileage, actual running time, length of halts and reasons therefore, repairs, and consumption of supplies. At the completion of the tests, the following reports are required: Serviceability of tires and necessity for a change; necessity for an emergency winch; elastic couplers; efficiency of spring pintles with which motors are now equipped; distribution of loads; advantage of having all four wheels guide wheels; any other changes to adapt present motors to artillery use.

[Note. *Army and Navy Jour.* Feb. 26, '16. 250 words.]

Report having been made covering experimental hauling of field artillery matériel by motor trucks by some militia organization, the Chief of Ordnance condemned the test as having been merely one of hauling guns and caissons over smooth roads at an average speed of 13 miles and a maximum speed of probably 18 or 20 miles per hour. No new data were supplied, and there was damage to the matériel. No hauling was done off the roads. Future tests must be approved by the Secretary of War before being undertaken.

[America's First Motor Truck Battery. By Joseph Brinker. *Scientific American*. Mar. 11, '16. 1000 words. Illus.]

The train consisted of an officers' car, a one-ton truck as scout, and four 4-ton trucks. Each of the latter hauled a three-inch gun and caisson. Three of the trucks carried the

battery personnel of 50 men, and the fourth carried spare wheels, spare parts and ammunition. The trip going (134 miles) was made at an average speed of 20 m. p. h. Speed returning not stated. The road was one of the finest in the country. The gun wheels stood up remarkably well despite the steady running.

[Army Ordnance Notes. *Army & Navy Register*, Apr 1, '16. 200 words.]

Experiments in motor traction for artillery are in progress. These tractors are being delivered to the 1st Field Artillery at Honolulu, and five tractors and eight trucks will shortly be delivered at Fort Sill. A type of armored motor vehicle is being experimented with at Rock Island Arsenal.

[Notes on Recent Tractor Tests at Ft. Sill, Okla. By Capt. W. Bryden, F.A. *Field Artillery Jour.* Jan-Mar, '16. 1200 words. Illus.]

Account of a test made by the Field Artillery Board with a 45-horse power caterpillar tractor weighing 13,000 lbs., manufactured by the Holt Manufacturing Co. of Peoria, Ill.

For the first few days the tractor was used to haul a complete section of heavy artillery over ordinary ground. Later tests were to determine to what extent these tractors could be used to replace the horses of a heavy battery. The load taken in tow consisted of a gun and a caisson, each with their limbers, completely loaded and equipped, with cannoneers mounted on the carriages. Total weight, 17,000 lbs.

During the tests the following difficult pulls were successfully negotiated: (1) Crossing a creek bottom, involving a pull up the far bank on a dirt road with a sharp turn and a grade of about 30%. (2) Crossing another creek bottom on a dirt road and ford with a grade of about 40% on one bank. (3) Crossing a shallow gravelly ford. (4) Crossing a railroad bridge, both tractor and tow running directly on the railroad ties. (5) Passing through a cattle-guard along the railroad ties. (6) Pulling gun and caisson out of a mud hole. In the last test some difficulty was encountered. The load had to be separated and pulled out separately. The gun had sunk down to the axle and was resting in the mud on its trail and apron shield. The tractor tore large holes in the ground, but failed to move the gun. A tow line made of two picket ropes was then attached to the tractor, which moved up on better ground. These ropes snapped like thread. A chain was then tried and it went the same way. A short tow line composed of rope and chain was then tried with success and the gun pulled out. The tractor then demonstrated with what ease it can load itself on a flat car. The use of these tractors will reduce the length of each section in column of march by 24 yards, and no cannoneers will be required to walk.

[Motor Transport for Field Artillery. By Maj. L. B. Moody, O.D. *Field Artillery Jour.*, Jan-Mar, '16. 6300 words. illus.]

## FIELD ARTILLERY

First experiments with motor transportation for field artillery were made in 1903. A combined battery and store wagon, total weight 12,000 lbs., was constructed. In the light of later developments, the project was too ambitious. It would have been better to have provided two trucks each weighing about 8000 lbs. Comparatively little was done in the way of testing motor power for field batteries until the impetus given by the foreign demand for motor vehicles used in the present war. Many of these would be unsuited for military use except for the superior roads in France. Russia is far more particular about motor vehicles than are the other Allies.

Early in 1915 tests were made over varied and difficult roads and terrain by the Ordnance Dept. to determine what types of motor vehicles were best suited for field artillery and armored car service. Three types of vehicles were tested, (1) Commercial trucks, both two and four-wheel drive; (2) farm tractors of the wheeled type; (3) farm tractors of the caterpillar type.

The four-wheel-drive truck was found far superior to the two-wheel drive truck for military purposes. Its principal advantages are: power transmitted to all four wheels with increased grip on the ground; ability to develop extraordinary power in emergencies by use of subtransmission; impossibility of stalling the engine by slipping of wheels; all weight is useful in increasing friction on ground; differentials so constructed as to prevent one wheel from spinning while the other is still; all four wheels are steering wheels, permitting shorter turns; brakes on all four wheels and in addition a transmission brake; separate power drum or winch for towing or for pulling truck out of holes.

These trucks were tested to determine their suitability for towing guns and ammunition vehicles, for carrying ammunition as a load, for use as battery and store wagons, and for use as armored automobiles. The experiment-soaked ground they will sink of their own weight up to the axles. Moreover in moving a heavy gun and carriage of 8000 lbs. weight a coefficient of friction of 50% is necessary, which is impossible on a slippery surface even with the best of chains. These trucks are, however, suitable for carrying ammunition, and recently bids have been issued for four-wheel-drive trucks weighing 6500 lbs. and capable of carrying a load of 5000 lbs. For rapid movements over good roads, it is better to load guns on the trucks because the rapid gaits will damage the gun carriage and caissons, these being vehicles of rigid construction. Anti-aircraft guns will be similarly transported, so carried on rails that they can be easily run on and off the truck.

A 50-horse power wheeled farm tractor weighing 8500 lbs. at first promised good results. On good level ground it developed a draw-bar pull of 4000 lbs. In bad mud the wheels began to spin and the pull was only 1500 lbs., whereas a draw-bar pull of 2000

lbs. is required to move a heavy gun in bad mud.

The most powerful tractor was the 25,000 pound 75-horse power caterpillar tractor, which exerted a draw-bar pull of 11,000 lbs., independent of the condition of the ground. Thus it could handle two sections of heavy field artillery under ordinary field conditions and certainly one section under the worst conditions. This tractor is too heavy for regular service in heavy batteries, a 13,000 lb. 50-horse power tractor being sufficient. One tractor per section of the firing battery is recommended. Test of such a tractor will be made by the Field Artillery Board.

Conclusions drawn are: (a) For light batteries, replace battery and store wagon and a part of the caissons by an equal number of lightly loaded motor trucks; (b) For special service on fair roads, where high speed is valuable, batteries could be equipped entirely with motor traction, both guns and ammunition being carried on trucks; (c) For heavy batteries up to and including 7.6-inch howitzers, caterpillar tractors should be provided wherever horses are used with light batteries, i.e., with the firing battery. Auto-trucks should carry the ammunition not hauled by tractors. The loads can be made heavier than with light batteries; (d) For heavier pieces than the 7.6-inch howitzer, tractors should be used for hauling the entire battery. The English government uses ammunition vehicles with caterpillar wheels. These are towed by 75- to 100-horse power tractors.

The Field Artillery Board has estimated that the initial cost for a motor heavy battery will be \$35,000 less per battery than for a similar battery using animal traction. This will solve the transportation problem for militia batteries. The difference in cost of maintenance is also very much in favor of the motor traction battery, being approximately \$25,000.

In an appendix are given the requirements and desirable features or points that should be remembered in selecting trucks or tractors for military service.

[Transportation by Motor Truck. By 1st Lt. H. G. Ferguson, C.N.G. *Field Artillery Jour.* Jan-Mar, '16. 2000 words.]

This is an account of a test with motor trucks made by Battery A. California National Guard. The route taken from Los Angeles, the station of the battery to San Diego and return, followed the state highway, a concrete road twenty feet wide. Four 2½ ton and one 1½ ton trucks were used. One 3-inch piece and one caisson were trailed behind each 2½ ton truck, the full complement of men and equipment riding on the truck. The 1½ ton truck was used as a scout car, carrying the signal detail and the fire control equipment. The speed maintained averaged from 15 to 18 miles per hour. Hourly inspections were made of the wheels, which were then lubricated. Battery and store wagons were carried on the bed of one of the trucks securely lashed in place.

A résumé is given of the effects of trip upon

the matériel. This shows that the matériel suffered in many ways, due to concussion and jarring of the rigid construction by a rapid rate of speed over a hard concrete road. A careful log was kept of all data relating to the care, use and expense of the trucks for the 268 miles covered in two days. The experiment showed many advantages in this method of traction, among which might be mentioned absence of horses, harness, no necessity for instruction in equitation, the difference between traveling 25 and 130 miles per day, absence of forage, blacksmiths, limbers, mules, drivers, etc., and last but not least the greater comfort and better condition of the personnel due principally to the absence of many fatiguing duties attending horse transport.

[Self-propelled or Automobile Guns and Cannons. By General Pietro Citati, Italian Army. *Rivista Militare Italiana*, Apr 16, '16. 5400 words.]

At the beginning of the war there were in use in the belligerent armies, not including the Italian, about 250,000 motor vehicles. Since that time the use of all types of motor transportation has been greatly increased.

There have been formed organizations mounted on motorcycles. These men are used for transmitting information, patrolling, scouting, etc. A seat may be quickly attached to the motorcycle and used for the transportation of wounded. Machine guns are now mounted on motorcycles of from 4 to 6 horsepower.

At first motor vehicles were used principally for the transportation of supplies, equipments, necessities for camping, etc., but their use was quickly extended to transportation of troops from one zone to another on the battlefield. We now have the automobile kitchen, and sterilizers and filters mounted on motor trucks to follow the troops and provide pure water. Wireless telegraphy outfits are installed on motor trucks and arranged so that the latter may generate the current necessary for working of the former.

The Germans have designed a Kar automobile used for excavating trenches. In soft ground it can excavate a trench 300 meters long in an hour, and in hard ground it can excavate about one cubic meter per minute.

We find that anti-aircraft, machine and light field guns are now mounted on automobiles. Heavy tractors are used for transporting the very heavy artillery guns. The adoption of automobile transportation will certainly bring about a great saving in the number of draft animals necessary for the army. This change has solved the problem of ammunition supply for the firing batteries. The intense artillery fire delivered by the different armies would be impossible if the ammunition had to be delivered by animal transportation.

On account of our increased responsibility and the addition of new colonies to Italy, after this war is over it will be necessary to enlarge our artillery to keep up with the other

armies that number their artillery guns by thousands. We shall need two additional army corps for the territory around Trentino and Trieste, and two more for the defense of Lybia. We shall then need 1600 guns for our army, thus necessitating 9600 animals, if we retain animal transportation. This will be a very serious problem in our country where animals are not plentiful. The use of motor transport would do away with the stampedes that occur when artillery fires into a group of animals.

The Austrians have adopted the 30.5 cm. mortar for use in their army. This mortar is drawn around by a motor truck. It was designed for use especially in the Balkans, due regard being paid to the roads and bridges on that frontier. The adoption of this method of transportation was due to the fact that the railroads in the Balkans were not numerous along the Austrian frontier, and the fortifications of the Balkan states nearby were located some distance from the Austrian frontier. These guns were used by the Germans in going through Belgium. It is claimed that they traveled on an average of 30 kilometers a day and could be put into action immediately upon arrival. They did very effective work against the fortifications of Namur, Givet and Maubeuge.

Discussing the 42 cm. German howitzer, the *Rivista di Artiglieria e Genio* of December, 1914, says:

The rapid fall of the Belgian forts was due to the high angle fire of the German 42 cm. mortar. Following the Krupp law for the dimensions of the large naval guns, that is, that the dimensions increase proportionally as the caliber, we deduce that the dimensions of this mortar are about one and one-half times that of the 28 cm. mortar whose dimensions are known. Its projectile should therefore weigh about 1100 kilograms and the bursting charge of the projectile should weigh about 150 kilograms. These projectiles threw off obnoxious gases and literally tore to pieces the heavy Belgian turrets. They were drawn by automobile trucks.

It is claimed that the guns drawn around by motor trucks move very rapidly on all kinds of ground. The French have an armored car that can move rapidly over any kind of ground, and the Austrian armored car can develop a speed of 50 kilometers per hour on good roads.

In an article in the *Illustrated Sport* of Jan 1, '16, Ettore Bravetta claimed that our heavy artillery would have to make use of motor tractors to reach the high points of the Alps.

All of this confirms the opinion that motor transportation should replace animal transportation wherever possible in the army. During the Boer War, England had to buy at fabulous prices the animals needed in South Africa. They had to be transported from all parts of the world. To-day the artillery ammunition wagon carries as much as ten used to carry, and it travels four times as fast as by the old method. With animal transporta-

**FIELD ARTILLERY—Continued**

tion we would require about 70 horses and about 30 wagons for a battery of four 120 mm. guns. With motor transportation we should need about 4 ammunition wagons and they could be moved very rapidly from one place to another, thereby insuring a large supply of ammunition.

The importance of the artillery became evident in the Russo-Japanese war. It has been increased in the present war. The French attribute their successes to their 75 mm. field gun, while the Germans claim that their large mortars and numerous machine guns have helped materially in their successes.

One great advantage in having the guns mounted on self-propelled trucks will be that they can change positions very rapidly and thereby remain exposed for the shortest time.

The artillery which can rapidly shift and concentrate its fire on any part of the enemy's line is liable to be victorious. We shall be able to construct turrets for the protection of the guns. It is very possible that in the future the artillery will be used to clear the trenches, after which the infantry will move up to occupy them. The question naturally arises as to what will happen when the two sides are evenly matched in artillery. It will then be necessary for one side or the other to bring up heavier and more guns. That has often happened in the present war.

This rivalry in construction of heavy guns may give rise to what will be known as the *land dreadnought*, and which could save many lives for us in reducing the forts like *Marlborough*, *Predil* and *Tarvis* which now bar our way to Vienna.

Some man with a more vivid imagination than my own may write of the horrible battles on land, sea, and in the air when all these changes have taken place. The artillery fire may become so intense that life on the battlefield will be impossible. No matter what form modern war may assume, I believe that as long as mankind exists we shall find one set of men opposed to another. That will not cease until the earth is populated by beings who have no passions, and who are totally different from the man of to-day.

[Motor Transport for Heavy Field Artillery. F. A. Board. *Field Artillery Jour.*, Apr-June, '16. 4500 words. One table.]

(Note. This is the report of the Field Artillery Board on the requirements for tractors and trucks for heavy artillery with a table showing relative cost and comparative expense of supply and maintenance between motor and horsed batteries.)

The tests were carried out with a Holt 45 h.p. caterpillar tractor, Jeffery and Duplex two-ton trucks in connection with the matériel of a 4.7-in. gun battery and a 6-in. howitzer battery. As the result of the tests, it was shown that whereas tractors are necessary with the guns, trucks having greater speed are required for the ammunition service. Only in very exceptional cases will horse trac-

tion be superior. The board, therefore, has drawn up tentatively the war organization of a heavy battery equipped entirely with motor transport. For convenient comparison a table is attached showing a battery as at present organized and equipped with horses; the same battery equipped entirely with motor transport; the same battery with a mixed equipment, part motor and part horse.

The board concludes that a motor drawn battery would initially cost \$40,000 less than a horsed battery, whereas the annual saving in pay, clothing, rations and forage would be about \$25,000. Two comparisons are startling:

(1) If the life of the tractors and trucks be placed at 5 years and the life of the replaced horses and matériel at 10 years, the cost of the former would be less. (2) If the saving of forage were spent for fuel and lubricants, the battery could travel 30 miles a day for a whole year.

Other advantages are: Enormous reduction in depth of columns in both firing battery and combat train; ability of this kind of transportation to follow railroads in addition to ordinary roads; saving of space in the supply trains; ability to maneuver by night as well as by day; simplification of recruit instruction; avoidance of fatigue on march, all the personnel riding.

No changes are recommended from the usual commercial types, the chief advantage in motor transportation being found in the facility with which it can be mobilized.

In testing the tractors it was found that the Duplex truck was unsuitable. The Jeffery truck was considered suitable for ammunition service, but not economical or trustworthy when off good ground. Tractors can handle light tows, but are inferior to draft horses in ordinary or difficult pulls. The caterpillar tractors altho much slower never failed, no matter how difficult the ground. They are ideal for towing the heaviest loads.

Included in the report are: Specifications for tractors and trucks; organization of a battery on the march or in action; defects and changes to be made; desirable features in various commercial types of trucks.

[A Motor Traction Regiment. Editorial. *Army & Navy Jour.*, Sept 23, '16. 750 words.]

Based upon experiments already conducted with caterpillar tractors and motor trucks, the newest (9th Heavy) field artillery regiment is to have exclusively motor transport. This regiment is to be stationed in the Hawaiian Islands. It will have 30 tractors for hauling the guns and caissons, and there will be a regimental truck company of 27 trucks. There will also be automobiles for the officers and motorcycles with side-car attachments for the men.

The regiment will be completely equipped and ready for service in a year. Four batteries will have 4.7-inch guns, and the other two batteries will be equipped with the recently adopted 6-inch heavy field howitzers.

The Holt Co., of Peoria, Ill., was the only

bidder for the tractors. Some of this type are already owned by the army. Five are already at Honolulu and several on the Texas border. Two of the Honolulu tractors are being used for experimental purposes, having been armed and armored.

#### —Organization

[Notes on the War. Concerning Field Artillery. Editorial. *Artill. Monatshefte*, July-Aug. '15. 300 words.]

Both Germans and French are using mountain artillery in the fighting in the Vosges Mountains.

Following the French and the Italians, the English have now also reduced the number of guns per battery from six to four.

[Military Notes. Proportion of Artillery to Infantry in the French and German Armies. *Rev. del Circulo Militar*, Sept. '15. 50 words.]

The number of pieces for each 1000 rifles is as follows:

Considering only the light field artillery: France, 4.6; Germany, 5.76.

Considering both light and heavy field artillery: France, 5.0; Germany, 6.4.

[Notes on the War. Field Artillery. By Teixeira Botelho, Lieut. Col. of Art. *Revista Militar* (Portugal). May, '16. 4900 words.]

(A simple compendium of diary notes from publications of the neutral countries.)

France has 36 field batteries to the army corps. 18 batteries are assigned to the divisions, 12 to the corps proper and 6 to the reserve. The proportion is 4.66 pieces to each 1000 infantry.

In Russia the reorganization of the artillery had not been completed at the beginning of the war. At that time there were 14 field batteries to the army corps. 12 of these batteries are equipped with field pieces and two with howitzers. The proportion was 3.3 to 1000 infantry.

England has 9 field batteries and 3 batteries of howitzers to the division. Proportion 4.2 per 1000 infantry.

Italy is armed with Krupp, 1906, and Deport. They have 200 field batteries, 27 mountain, and 14 howitzers. Proportion 4 per 1000 infantry.

The German equipment consists of 18 field batteries and 10 howitzers to the corps. Proportion 6.1 to 1000 rifles.

Austria has 8 batteries of field artillery and 6 of howitzers to the corps. Proportion 3 per 1000 men.

Since the beginning of the war all countries have increased the proportion of artillery.

Before the beginning of the war the proportion of artillery to cavalry was: Germany, Austria, and Russia 3.3, Italy 2.7, and England 1.33.

Any apparent discrepancy in the percentage given is accounted for by the difference in the number of pieces to the battery.

#### Belgium

[Foreign Notes. Belgium. Proportion of Field Artillery at the Beginning of the War.

*Mem. de Artilleria* (Spain), Jan, '16. 400 words.]

The Belgian army consisted of six army divisions and one division of cavalry. Each of the former should have contained three or four mixed brigades (the 3rd and 4th divisions contained four), a regiment of cavalry of four or five squadrons, three battalions of artillery, of which two were light howitzer battalions, and a battalion of engineers of two companies.

The mixed brigades consisted of two regiments of infantry of three battalions each, a battalion of three batteries, a machine-gun company and a platoon of mounted gendarmes.

The division of cavalry consisted of two brigades, a cyclist battalion, a battalion of three horse batteries and a company of cyclist sappers and pontoniers.

The effectives required by the above units were very different from those really existing. It was not possible to mobilize more than 117,000 men. The howitzer batteries are not in existence yet. The total Belgian artillery consisted of twenty brigade and seven divisional batteries, a total of 324 guns of 7.5 cm. caliber.

#### Portugal

[Mobilization of the Army of the Republic. By Captain Luiz A. F. Martins. *Revista Militar* (Portugal). Feb. '16. 4500 words.]

The small proportion of artillery assigned to the division, the unit of battle, does not warrant the retention of the regimental organization on a war footing. According to the law of 1911, the commander of the regiment of field artillery assumes command of the divisional artillery and the lieutenant colonel assumes command of the divisional ammunition column. During peace, he commands separate batteries of the regiment when mobilized. The batteries are not mobilized in regiments as are infantry and cavalry.

21 articles from the general regulations governing mobilization are given with comments.

#### Spain

[Domestic Notes. The Third Battalion of the Mounted Regiments. *Mem. de Artill.* (Spain), Apr. '15. 5000 words.]

The proposition of the Minister of War to add a third battalion to the regiments of artillery is but a step in advance, doubtless a very important one, toward an adequate organization of the field artillery.

It is not difficult to establish the lack of the proper proportion of artillery in the army of the first line. The most pressing need is to furnish each of the 14 divisions with divisional artillery. This would necessitate the creation of two new regiments.

If the new regiments should have the same composition as those already existing, each division would then have 24 field pieces, an insufficient number, being only two guns per 1000 rifles.

Among all the nations whose military power is worthy of mention, Spain has the lowest proportion of guns in its units of combat.

**FIELD ARTILLERY—Continued**

This deficiency is a cause of inferiority which the present war is making more evident each day.

In our opinion, each of the 14 divisions in the Peninsula should have one regiment of artillery. The number of pieces should be increased to 36 in each division by organizing the third battalion in each regiment. This would bring the total number of pieces in the Peninsula to 504, a number slightly larger than that at the disposition of Rumania.

**—Night Operations**

See

**ILLUMINATION—FOR NIGHT ATTACKS****—Range Finding**

[A Rough Method of Calculating at the Battery the Relative Range of Consecutive Rounds. By 2d Lieut. W. M. Bocquet, R. G. A. *Jour. Royal Artillery*. Dec., '15. 350 words.]

This method depends on the measurement of the length of time between the sound of the gun firing and the sound of the shell-burst. It is not accurate, but may be of some assistance in conjunction with other methods of observation.

The time interval is measured at the battery by a stop watch and is made up of two factors.

(1) The time of flight of the shell.

(2) The time taken by the sound of the shell-burst to reach the battery.

The variation in range corresponding to the difference in time can be calculated by means of the range table. Each one-fifth second in time gives an increase or decrease in range of 23 yards.

See also

**FIELD ARTILLERY—FIRE CONTROL  
ZEISS RANGE FINDER****—Tactical Handling of**

[The Reconnaissance and Orders of the Battalion Commander of Field Artillery. By J. Mirelis, Commanding the Regiment of Horse Artillery. *Mem. de Artill.* (Spain), Apr., '15. 11,000 words.]

Our regulations for tactical instruction, like those of other nations, do not and cannot give the details of execution of the innumerable problems which arise in practice. The character of the results accomplished by the batteries, in fulfillment of the mission confided to them, will therefore depend on the ability of the commander of the battalion.

Numerous occasions have occurred in recent wars where the artillery mistook or failed to execute its mission. In most cases the trouble has been due to technical errors. Either the batteries have been assigned no mission whatever, or one has been communicated in a vague and indefinite manner.

The battalion commander, as chief of the tactical unit and alone responsible for the execution of the duties assigned it, must not confine himself to the strict requirements of the regulations, but must supplement the orders he receives, clarify them and add necessary data so that the captains will have a clear,

concrete and definite understanding of the mission.

Higher commanders may employ such terms as "if possible," "the batteries will endeavor," etc., but the battalion commander is obliged to interpret them and suppress all ambiguities. The fundamental consideration is that the battalion commander make good tactical use of the arm.

The first point to be considered is the personnel of the battalion staff. After the battalion commander has received his orders, the following distinct operations are to be performed:

1. Reconnaissance of the route to be followed by the battalion commander.
2. Maintenance of contact between the battalion commander and his batteries.
3. Establishment of the service of security in march, if such be deemed necessary.
4. Reconnaissance of the field proper.
5. Organization of the service of security (in position).
6. Promulgation of the orders to the batteries.
7. Organization of the service of observation of the enemy's position and of the effects of fire.
8. Establishment of connections and communications.
9. Reconnaissance of routes to the various probable positions.

Battery officers may assist in the reconnaissance, but not in the service of security (in position), since they will then be urgently needed in the preparation of positions and in obtaining initial data.

The personnel of the staff should consist of one officer, two sergeants, eight scouts, and two horse guards.

The orders of the battalion commander cover: 1st, the advance of the batteries to position; 2d, their establishment in position; 3d, the direction of their fire in combat; and 4th, changes in position.

The dispositions for the advance will depend, in great part, on the information which the bearer of the order to the battalion commander can give. He should be interrogated as to: 1st, whether or not he can act as guide; 2d, the approximate distance to be covered; 3d, whether it is necessary to pass near any point not occupied by friendly troops.

These three points are important. On the first depends whether or not a reconnaissance is necessary, the second fixes the rate of march, and the third determines the necessity of the service of security in march.

Assuming a reconnaissance necessary in advance of the battalion commander, one of the assisting officers will be detailed to make it. His order should contain: (a) the general direction of the route to be followed, the point where it terminates, and important places on the way; (b) available information of the location of the nearest troops of the enemy; (c) the same concerning friendly troops; (d) time available and territory to be covered; (e) distance at which the battalion commander will follow.

If necessary, the staff officer of the battalion will be charged with the service of security of the column in march. His order should cover: (a) the situation as far as known of friendly and hostile troops; (b) route that the batteries are to follow; (c) flank on which protection is necessary; (d) points where protection is necessary.

As a general rule, the captains will not accompany the battalion commander, but will remain in command of their batteries. In this case, the battalion commander should inform them, if possible, which flank is menaced and what are the points the passage of which is considered dangerous.

The last order to be given before beginning the reconnaissance is that of turning over the command. This should contain the word "reconnaissance," as an indication that the batteries are advancing to occupy positions, and the rate of march in kilometers per hour should be given. Permissible rates are 15 to 20 km. per hr. for the battalion commander, and 8 to 9 km. for the batteries.

A higher commander may delegate certain functions to his chief of artillery. The latter may in turn trust some of his special duties to the good judgment of his battalion commanders. But this delegation must not extend farther. The work of a captain is already heavy enough without loading him with amplifications and emendations of what his superiors have left incomplete.

In the most general and difficult case, when the battalion commander has received incomplete and vaguely defined orders, he will have:

1st. To choose positions for the batteries within a certain zone.

2d. To fix the number of batteries to be employed.

3d. To mark the respective positions.

4th. To effect a distribution of duties.

5th. To give orders concerning opening fire.

The respective rates of march of the battalion commander and the batteries are approximately as two to one. The distance to be covered in relation to the estimated time required for the reconnaissance will determine whether or not it will be necessary to select a position in which the battalion may await the completion of the reconnaissance.

It is more easy and rapid and gives rise to fewer oversights and errors if the commander provides himself with a pad especially prepared beforehand, and sets down during the course of his reconnaissance the decisions that he arrives at, rather than attempting to wait and give them verbally.

The order for the occupation of a position need contain but few words, since the captain is interested only in knowing, with the greatest exactitude possible, the data of the problem of fire the solution of which is entrusted to him. It is absurd to communicate to a captain the intentions of the commanding general or the supposed plans of the enemy. Neither is he concerned as to the location of the vanguard, nor the distance to the main body. What he has a right to be told is: "From such a position, your battery will de-

stroy or neutralize such an objective situated at such a point"; or, "Keep a vigilant lookout over such a zone, and open on artillery or infantry or both, if they establish themselves there," etc.

Four strokes of a pencil will often tell more and be less susceptible of being misunderstood than a long conversation. If a sketch is to be made finally, it will be preferable to use it from the beginning, making a small sketch in place of a long discourse. For this no artistic aptitude is necessary. No inconvenience whatever will result if, lacking skill to represent a given object or accident of terrain, any sign whatever is used and the name of what it is desired to represent is written above.

The generality of officers have formed an erroneous conception as to the utility of perspective drawings, the use of which has not been as extended as it should be. Even among those who are convinced of the great advantages that sketches have for the designation of objectives, there exists the belief that their use requires an inadmissible special preparation, since the battalion commander will not always have the same personnel of captains and lieutenants under his orders, not even during the time required for this preparation. This argument fails completely, since practice of the oral and graphical methods teaches that the verbal method of designation gives good results only when, through force of repetition in many exercises, a community of language which never exists at first, has been acquired by those taking part. Proof of this is that in the instruction of gun pointers, great importance is given to exercises of designation. During the annual examination of pointers, we have seen the graphical method employed many times to assign extremely difficult targets and have never observed the slightest inconvenience in hundreds of designations made to different officers by a battalion commander who is a poor draughtsman.

The service of observation of the enemy's position and of the effects of fire and the establishment of connections and communications require no special orders from the battalion commander, but require constant instruction of the personnel of the staff.

#### —Tactics

See also

#### TACTICS—COMBINED ARMS

#### —Tactics—Co-operation with Other Arms

[Tactical Training of Artillery Officers. By Captain R. Martinez. *Mem. Del Ejército* (Chile), July, '16. 1800 words.]

As regards the tactical use of the different arms and their co-operation on the battlefield, many lessons can already be deduced from the experiences of the present war. For this co-operation to be effective, a mutual understanding of the tactics of each arm is absolutely necessary. Every artillery officer, irrespective of grade, should have a thoro tactical training in order that his arm may be used and may render the assistance required due to the exigencies of modern combat.

To have a clear conception of what is being

**FIELD ARTILLERY—Continued**

observed while on reconnaissance duty, and to be able to pick out the information necessary for an effective employment of the artillery, it is necessary that the artillery subaltern undergo a specially prepared course of training.

To guarantee a close co-operation between the artillery and its own infantry, artillery officers should accompany the advanced infantry lines. The infantry commander has not always the time to communicate to the artillery observer everything that is wanted from the artillery. The observer, by reason of his technical knowledge, can be of great assistance in advising the infantry commander as to the best methods to pursue to bring about effective artillery support. But in order to carry out a mission of this kind, the observer should have a thoro knowledge of the details of the infantry combat to appreciate what is happening around him.

When we come to the battery commander, he has to deal with many problems arising during the firing, and which require a quick decision in order to carry out the important mission of supporting the infantry. The tactical handling of the command is the main duty of a major. He is the one to order the change of objective due to the unforeseen necessities of the combat. The regimental commander is the director of the tactical employment of the artillery, and he is authorized to act on his own initiative.

It is well to quote the words of Colonel Haenlein: "No commander will ever be a good leader of men unless he is thoroly familiar with the infantry tactics." Infantry is always the principal element on the battlefield.

How can the artillery officer acquire this tactical training? By practising map maneuvers, which not only teach the use of the artillery but also the tactical handling of infantry. In order to learn all the details, a start should be made with the smaller units. Terrain exercises should follow map maneuvers. Let the artillery officers select the positions; let all officers then proceed to the selected positions and study over the measures taken; follow this up with a trip to the terrain over which the infantry will have to maneuver. Upon the completion of the exercise, have a critique dealing with the handling of the infantry and of the artillery. After the above training is completed, take up the subject of field maneuvers.

As a final step, and with a view to learn the details connected with the training of infantry units, let artillery officers be attached to these units.

[The Tactics and Technique of Field Artillery. By Eduardo Pellen, Lieut. Col. *Revista de Artilharia*, July, '16. 6000 words. To be continued.]

(An elementary study of the use of field artillery in campaign, explaining the usual, well-known functions of batteries assigned to different duties in battle, the position of the

artillery on the march, its use in advance guards, etc., etc.)

**—Tactics—Selection and Occupation of Position**

[Reconnaissance and Occupation of Battalion Position. School of Fire for F. A. *Field Artillery Jour.* Jan-Mar, '16. 8000 words.]

(Note: This is subject published by the School of Fire for F. A. and being almost a condensed text-book is impossible of further condensation without omitting important details. Only a summary of the duties of the different units in the battalion can be given. A close study of the article will emphasize its importance to field artillerymen.)

Two principles are fundamental: (a) Battalion agents are under exclusive orders of the battalion commander; (b) battery details must be left at the disposal of the battery commanders except in emergencies to supplement the work of the battalion detail.

The battalion commander, in addition to a statement of the situation and the plans of higher commanders, must give orders upon the following points:

1. Approximate distance to and general location of position to be occupied.
2. General description of the route to be followed whether under cover or exposed.
3. The point at which the battalion shall await further orders.
4. Special instructions to batteries concerning: (a) routes to be followed by separate batteries; (b) order of march; (c) rate of march.
5. Special instruction to combat train concerning: (a) Whether to march separately or with the battalion; (b) probable location and by whom selected; (c) any information concerning the ammunition train; (d) communications with individual batteries.
6. Instructions to adjutant concerning reconnaissance or the method of marking the route.
7. According to circumstances, instructions concerning: (a) Where battery commanders and their details shall march; (b) whether battalion commander is going ahead at once; (c) whether battery details will assist to mark the route or to connect.

When the battalion commander goes forward by himself and leaves the battalion behind, he informs the senior battery commander of the following:

1. Any change or later developments in the situation.
2. Whether captains will come forward at once or await further orders.
3. Route to be followed by the battalion and method of marking or indicating; rate of march.
4. Any further orders according to circumstances.

Having completed his preliminary reconnaissance, the battalion commander gives orders and instructions concerning:

1. Any change or later developments in the situation.
2. General front to be occupied by the battalion.



3. Limits of hostile sector to be covered by the battalion.
4. Battalion observing station, and position of horse holders.
5. Rendezvous point for battery commanders and details.
6. Special reconnaissance of the position when necessary.
7. Communications with higher commanders or supporting troops, and auxiliary observers.

The battery commanders having arrived at the rendezvous receive such instructions concerning the following as may be necessary:

1. Any change or later developments in the situation.
2. The mission of the battalion.
3. Sector of fire for each battery, including location of friendly and hostile troops, communications, and location of auxiliary observers.
4. Complete information concerning the position, and instructions for its occupation.
5. Time for opening fire.
6. Special precautions for security for flank or detached batteries.

When a reconnaissance to the hostile front is directed, it is conducted by the adjutant assisted by the three battery reconnaissance officers and the six battalion scouts. Their duties are clearly outlined.

The article then summarizes the duties of the other members of the battalion detail in complete detail. Those classified are, the battalion sergeant major, signal corporals, signal privates, agents, scouts, musicians, battalion commander's orderly, and the adjutant's orderly.

#### —Tactics—Use of to Cover Retreat

[The Pursuit After the Great Battle in Lorraine, Aug. '14. (Abridged translation from *Artill. Monatshefte*.) By Brig. Gen. H. A. Bethell. *Jour. Royal Artillery*, Feb. '16. 3000 words.]

(The writer of this article, Major Seeger, commanded the Horse Artillery Abteilung, three batteries of four guns, of the 15th Prussian Regiment of Field Artillery.)

At the outset of the war, the French made a dash into Lorraine driving the Germans back to the Saar. We, the Germans, brought up strong reinforcements and fought a great battle, culminating on the 20th Aug. 1914, in which we completely defeated the French invaders. Early on the morning of the 21st my abteilung was at Insweiler, when orders came from the 6th Army at Helmer to pursue the enemy. Our cavalry division trotted off in three columns, and we accompanied them. At Maizières our advanced squadron reported that the enemy were holding the canal at Moussey, and that his long columns were toiling up the hill to Avricourt. I was ordered to advance at once to a position north of Moussey and open fire on this presumably good target.

Now the difficulty was to get hold of my three batteries, one of which had accompanied the advance guard, and was visible filing slowly along the edge of a wood, while

No. 2 battery was advancing into position. I thought and still think the artillery commander should be well to the front, say with the reserve of the advance guard, in order that he should get his information early and bring his batteries into action without delay.

I had a choice of two positions; either just east of the Maizières-Moussey road, or 500 meters further to the front at about the same level. I chose the latter in order to get away from the ground which emerged from woods behind us.

I reconnoitered the position and when joined by my battery commanders, pointed out to them my O. P. and had my "scissors" telescope set up.

Our preparations hardly could have escaped the watchful eyes of the French gunners, for, as we soon had occasion to know, they already had several batteries in action to protect their retreating columns of infantry which were in a very dangerous situation.

Fifteen minutes later my batteries came up. To the one which arrived first I already had assigned the French columns on the road to Igney, which it was urgently necessary to engage before they disappeared over the hill. Unfortunately, in the hard ground, it took time to dig in the spades so as to get the elevation for the range, which was over 6000 metres.

In the meantime I was searching the landscape with my scissors telescope for other targets, when I made out what finally proved to be a French battery going into position about 4400 yards distant, on a flat spur somewhat below us and apparently unsuspecting of our presence. I divided this battery with its flank to us between No. 1 and No. 3 batteries, ordering No. 1 to engage with searching fire at successive elevations in order to obtain some effect at once, while No. 3 bracketed with H. E. taking advantage of the fire of No. 1 to assist observations.

The simultaneous searching and bracketing gave good results at once. The French battery was visibly taken by surprise by the sudden enfilade fire. First the limbers, which were standing not far behind the guns, trotted off to escape the zone of fire. I ought to have assigned the limbers to one of my batteries as a target. The gun detachments except No. 1 made a bolt for the cover of a hollow behind the battery which was screened from us by high standing corn. No. 1 gun swung in our direction, picked us up and fired the first shot in 30 seconds. I ordered gun fire at accelerated rate and the detachment of this gun soon took cover. I now ordered percussion fire with H. E. by one battery to demolish the guns while the other battery searched the ground in rear with shrapnel to keep the men away from the guns, and in this for the time being it was successful. The guns seemed abandoned, so I sent a detachment of twenty of my men to take possession of the abandoned guns, but the detachment was driven back by rifle fire.

While my batteries were keeping up a steady fire on the abandoned battery, the

**FIELD ARTILLERY—Continued**

French set about saving their guns, and it was a regular academic example of one unit helping another in retreat. They told off two batteries to smother us with fire in order to silence us, while the original battery withdrew its guns and disappeared as quickly as possible.

The abandoned guns were dragged to shelter by hand under cover of a heavy fire from concealed batteries which we could not locate and could not reply to. They had taken the range of a spur in rear of us, so our guns suffered few casualties, but the second and third salvos of the enemy's *tir progressif* went into the woods where our cavalry had taken cover and caused many casualties in the cavalry. One battery took the range too short and the shells striking in front of No. 3 battery interfered with its fire and with observations from my O. P.

This combat had kept two of my batteries engaged for about two hours. In the meantime I had ordered my left battery to advance to a position on the Rhine-Marne canal from whence they could better command the low ground at Moussey. They failed to get forward in consequence of the enemy's heavy fire on Porte St. Marie.

Throughout the afternoon our cavalry failed to get across the canal, except in small detachments, so the French were able to continue their retreat comparatively unmolested. Also the squadron told off as my escort and posted on my left, came under the enemy's artillery fire and retired to a safer position, so that several times I had to intervene personally in order to maintain the absolutely necessary protection of our exposed flank. Artillery in action have the absolute right to demand protection from the other arms, and these must not withdraw an escort once posted without urgent necessity, such as did not exist in this case. In plain words, they must not run away and leave the guns in the lurch.

The task assigned to the French batteries was to prevent at all costs the masses of our cavalry from crossing the canal in pursuit, and this they achieved to perfection. We did not succeed in cutting off a single detachment of the French rear guard. This action shows, better than any academic example, the immense value of our weapon in covering a retreat. It was a day on which we all learned much, especially from our enemies.

**—Use of in European War**

[Our Baptism of Fire. By Maj. A. Seeger, 15th F. A. (horse), German Army. *Field Artillery Jour.*, Oct-Dec, '15. 5000 words.]

(NOTE.—This is an English translation of an article which originally appeared in *Artill. Monatshefte*, June, '15. See INTERNATIONAL MILITARY DIGEST, p. 325, Nov, '15, and p. 312, quarterly, Dec, '15. The same English translation also appears in *Jour. U. S. Cav. Assn.*, Dec, '15.)

[A Brave Battery. Anonymous. *Artill. Monatshefte*, July-Aug, '15. 1000 words.]

On Nov 18, the 2d battery, 47th F. A., was supporting the attack of a German infantry brigade against the Russians near Lodz. This brigade had been pushed forward 4 km. ahead of neighboring troops, with orders to hold the edge of a wood about 1 km. wide which projected like a wedge into the hostile position. The battery was compelled to take position on the edge of the woods, one-half of it facing to the west and the other half to the south. The hostile Russian infantry was not more than 300 m. from the edge of the woods, and it strongly intrenched itself over night. The next day the first infantry attack was easily repulsed, the small arms bullets perforating the shields. About noon, the fire of Russian light and heavy artillery was concentrated on the battery and silenced it. The gun detachments were compelled to seek cover, but as soon as the Russian infantry advanced, fire was again opened and the attack repulsed. The Russian artillery again opened fire, compelling the German infantry to withdraw and the battery to cease fire again. About 3 p. m. another infantry attack was launched. Only two or three guns were able to resume fire, and practically alone repulsed this third infantry attack, so that the position could be held. In the last attack, only a few men were able to serve the guns. The losses in killed and wounded in the battery totalled more than 50 per cent.

[The Combats in Pursuit Following the Great Battle in Lorraine, Aug, 1914. By Maj. A. Seeger, 15th F. A., German Army. *Artill. Monatshefte*, Sept-Oct, '15. 5500 words, map.]

(Note.—In a former article, "Our Baptism of Fire," by the same author, [see *Artill. Monatshefte*, June, '15, and *Mil. Digest Quarterly*, Dec, '15, page 312] the first engagement of the Horse Artillery Battalion, 15th F. A., which the author commanded, is described. In the present article he continues his narrative by giving an account of the operations of the 7th Cavalry Division and the Artillery Battalion during the big battle in Lorraine which took place in the canal and lake region between Metz and the Vosges Mountains on Aug 20, 1914. From a professional point of view, both of these accounts are unique in the literature of the war.)

The Germans had evacuated Saarburg in accordance with their plans and on Aug 17 the French entered the town, confident of success. Beginning with Aug 14, the 7th Cavalry Division had been deployed west of Pfalzburg keeping in constant contact with the enemy, who was advancing in great strength over a long front from the south and west. On Aug 18, the division received orders to move to a position on the right flank of the army, marching around the rear of the different corps then concentrating for the coming battle. On arriving at Münster, the division filled a vacant place in the battle front between the 21st Army Corps and the 1st Bavarian Reserve Corps. The division did not participate in the big battle of Aug 20, but formed a part

of the army reserve, following the progress of the battle from a distance. After the Germans in several engagements had secured the crossings of the Saar Canal and the infantry had fought its way through the dense forests near Mittersheim and Finstingen, the cavalry division was ordered forward advancing from Insweiler to Maizières with orders to attack and pursue the retreating enemy who was withdrawing toward Lunéville. It was learned that the French were making a stand along the Rhine-Marne Canal, the field artillery covering their retreat in an admirable manner. The advance guard squadron reported that heavy hostile march columns were struggling up the hill at Igney, retreating to the south and west. The battalion commander, estimating the probable point reached by the advance guard battery, directed it to take position along the woods north of Moussey and to open fire immediately. Due to obstacles and to the congestion of troops all along the road through the woods, the battery failed to get to the position in proper time. The cavalry regiments were all dismounted. They blocked the roads and seemed very slow in getting forward their dismounted men to fight on foot. Later they learned to do this much better. When the battalion commander reached the front, he saw the need for haste but found himself without his headquarters detail or any batteries. On looking over the ground, he decided to take a position for the whole battalion about 500 m. farther to the front, principally to get more cover and to get away from the congested road exit and the edge of the woods directly in his rear. He therefore ordered all of his batteries to this position, transmitting this order by the general's aide, who was also instructed to clear the roads for the batteries. In the meantime the headquarters detail arrived and the batteries after considerable delay got into position. One battery was ordered to fire on the retreating march columns, but the range was so great (5600 m.) that valuable time was lost in digging pits in order to sink the trails. Now in reconnoitering the hostile sector, the battalion commander suddenly observed with his telescope a battery winding its way like a snake, into a position on his extreme left front at 4000 m. Its position was so far around to his flank that there was considerable doubt whether it was a pursuing Bavarian battery or a French battery. It seems that some of the Bavarian Reserve batteries took the field in a dark blue uniform similar in color to that worn by the French artillery. The guns were now observed to unlimber and the limbers moved down the slope under cover. As the muzzles of the guns were turned to the north the battalion commander became positive that it was a hostile battery. This was moreover confirmed by the long gun barrel of the French gun and the disposition of the sections in the firing position. On his own responsibility, he ordered one battery to open with shrapnel echelon fire and the other to destroy the matériel with shell. Even though subjected to

an enfilading fire, one gun of the hostile battery managed to change front and to get off one shot which struck very close to the observation station. The cannoners were seen to scatter, taking cover in a fold of the ground and soon the battery was silenced. A slow and continuous fire was now kept up. The battalion commander considered the battery destroyed and sent forward 1 officer and 20 men to secure the prize. But he had reckoned without his foe. They never got nearer than 1500 m. to the battery, being stopped by hostile infantry. In the meantime the French artillery commander busied himself to rescue his unfortunate battery, and this the German artillerymen admit was done in a masterful manner. Two hostile batteries, firing from concealed positions which were never discovered, suddenly opened on the German batteries with an overwhelming fire, the plan being to neutralize the German batteries and during this action to withdraw the guns of the unfortunate battery by any means. However, most of the firing of the French was 300 m. over, creating havoc with the dismounted cavalry along the edge of the woods. The latter at once dispersed and took cover, but not without having suffered considerable losses. The French had no doubt carefully registered the edge of the woods and the road exit. The accuracy and uniformity of their fire were remarkable. In sweeping the zone they began also to search the ground in front of the guns but produced little effect in the batteries. Our position was behind the crest and was probably disclosed by the dust raised by the cavalry and the indiscreet action of one of the battery commanders in collecting his men on the forward crest to show them the hostile battery apparently destroyed. In the future, positions will be taken much farther behind the crest. Too much practice cannot be had in designating targets and using reference points. For the most part of the firing, the French searched the edge of the woods in rear. In the interim an attempt was made to rescue the guns of the unfortunate battery. Drawn by unknown forces they were seen to move away. Evidently a cable or rope was used drawn by the detachments hidden in the grain fields in rear. In the beginning a mistake was made in not assigning one of the batteries to attack the hostile limbers, thus surely immobilizing the battery. At one time a limber appeared in order to rescue a gun, but was immediately taken under fire and stopped, all the horses being killed. After that no further attempts were made. However the hostile artillery was entirely successful in carrying out its mission, namely, to cover the retreat of its own infantry and to prevent our pursuit. Until late in the afternoon the canal was nowhere crossed by large forces of cavalry.

During the fight strong protest had to be made on several occasions against the withdrawal of the support of the other arms who were protecting our flanks from attack by an enterprising enemy. But night finally came. The battalion, without any support from the

## FIELD ARTILLERY—Continued

other arms worth mentioning, had held out to the end. During the afternoon, one of the batteries was directed to change position in order to cover the low ground near the canal, but it never got into action again.

The hostile French artillery accomplished its task in a masterful manner and the fight showed, much better than any type school example can do, the extraordinary importance of the field artillery in covering a retreat. We failed to cut off any of their forces, and the pursuit of the cavalry across the Rhine-Marne canal was completely stopped. After an all-night march to the rear we went into bivouac at Azoudange. A few days later I sent a detachment from our combat train to secure any material left behind by the hostile battery. Twelve caissons were found. It was also learned that the enemy had abandoned four guns in Avricourt only a few hundred yards from the firing position. These were the guns which my batteries destroyed, but the Bavarians had already secured them, and at that moment the guns which I would have liked to see in front of my barracks at Saarburg were on the way to Munich.

[The Scout's Note Book. By G. N. Tricoche. *Field Artillery Jour.* Oct.-Dec., '15. 4500 words.]

(This is an extract from the diary of a young French corporal, translated from *Revue des Deux Mondes*, Aug, 1915, by G. N. Tricoche, who has enhanced the narrative by appropriate comments in which he makes comparisons with our service.) The diary begins with an account of the mobilization of the corporal's battery stationed at Troyes, Champagne, on July 28, 1914. The firing battery left at 7 a. m. on July 30; the combat train not until the evening of Aug 3. On Aug 4 the whole battery was brought together at a point not far from the frontier after the combat train had traveled 10 hours by rail. A tedious routine was carried out for several days, the batteries being held ready to move, teams always hitched and harnessed. Owing to uncertainties of movement the men could not cook their rations. On Aug. 9, a rapid reconnaissance as far as the frontier was made. This was repeated daily without encountering the enemy. On the morning of August 14, the Cavalry Division from Lunéville was encountered. On this day the battalion came under fire for the first time. The German fire was not very effective. German spies were everywhere, sending information to the enemy from points behind the French lines. The battery remained in position for many hours. In the evening it withdrew and got back to its cantonment about 1.30 a. m. On Aug 15, the battery was again engaged and suffered some losses, the position of the limbers having been discovered by aeroplanes which soon directed the hostile fire to their locality, causing the explosion of a full limber. The horses were also stampeded and many were killed. The battery changed position, but

finally came back to the old one, since the German shell did no harm although falling very close to the guns. The French felt very much the want of heavy artillery, in which the Germans were very far superior. Sunday, Aug. 16, was practically a day of rest. The guns started out to their position, but were soon blocked in the impassable roads. The guns were now beginning to become stationary, and that night remained in their positions. One night the battery was almost surprised by the Germans, but they were repulsed by the infantry supports. This was repeated a little later, but the Germans, coming within the field of the searchlights, were overwhelmed by a withering fire at 1500 m.

Later on at Flainval, the batteries occupied a good position, but the observing station was about 1800 m. distant. This made hard work for the battery detail and taxed the communications to the extreme. The battery remained here for two weeks. All rations for the observing detail were cooked at the combat train and brought forward. Even though in a covered position the batteries always entrenched to give cover to the men. The guns were screened from aero observation. Ammunition was expended lavishly, frequently 144 rounds per gun being expended in a single morning.

The personnel of the firing battery was always under cover and worked very calmly. In a 15 days' fight in the same position, during which the batteries were subjected to the fire of the German heavy artillery, the effect produced was very slight. Hostile aeroplanes were always the bane of the artilleryman's existence. The Germans did not keep their 77 mm. guns within the range of the French 75 mm. gun.

The writer speaks in glowing terms and with almost filial fondness of his battery commander, a very nervous but able man who died on the field of battle. After the battle of the Marne, the battery was shifted to the western part of France in Normandy.

[The Combats in Pursuit Following the Great Battle in Lorraine, Aug, 1914. By Major A. Seeger, 15th F. A., German Army. *Field Artillery Jour.*, Jan-Mar, '16. 5500 words. 3 maps.]

(Note: This is an English translation of the original article which appeared in *Artill. Monatshefte*, Sept-Oct, '15. See *Mil. Digest Annual*, 1916, page 336.

[A Belgian Battalion of Field Artillery on the Yser. Trans. by G. N. Tricoche. *Field Artillery Jour.*, Jan-Mar, '16. 1500 words.]

(Note: This article is made up of extracts from *Les Pages de Gloire de l'Armée Belge*, by Commandant W. Breton; and *Les Opérations de l'Armée Belge en 1914*, by Lt. Col. H. Le Comte. *Revue Militaire Suisse*, Dec, '15, with commentary by the translator.)

—Use of in European War

[The Day at Lens. By Maj. A. Seeger.

15th F. A., German Army. *Artill. Monatshefte*, Jan, '16. 8000 words, 1 map.]

(Note.—This is the third of a series of articles by the same author. In the first article, "Our Baptism of Fire," *Artill. Monatshefte*, June, '15, and *Mil. Dig. Annual*, 1915, p. 206, the first engagement of the Horse Artillery Battalion, 15th F. A., which the author commanded, is described. In the second article, "The Combats in Pursuit Following the Great Battle in Lorraine, Aug, '14," *Artill. Monatshefte*, Sept-Oct, '15, and *Mil. Dig. Annual*, 1916, page 335, he gives an account of the operations of his battalion in the big battle in Lorraine, Aug 20, '14. In the present article, the author gives an account of the great cavalry operations in the "Race for the North Sea," in which his battalion again took an important part. From a professional point of view, all of these accounts are unique in the literature of the war, are free from all venom and bitterness, and of strict military value.—Ed.)

After the great cavalry engagements around Bapaume in France during the last days of Sept, '14, the cavalry divisions, then under supreme command of General von der Marwitz, were relieved in this vicinity by army corps of the field armies. Both sides in an attempt to outflank each other then began the extension of their northern flank, which extension did not cease until it rested upon the North Sea. In the first days of Oct the German cavalry divisions had received orders to march off to the north, leaving Arras to the west, and to protect the right flank of the German armies by occupying the country northwest of Douai. Strong French and especially English forces were then advancing from St. Omer via Béthune toward the coal and industrial district around Lens, which the Allies were trying hard to secure in order to prevent this very important region from falling into German hands.

By a forced march on Oct 2, the 7th Cavalry Division, to which the Horse Artillery Battalion 15th F. A. was attached, moved from the vicinity of Bapaume to Vitry-en-Artois, arriving at the latter place late the same night without having fired a shot. The country in which the operations for the succeeding days took place was very difficult due to the intricate network of coal mines, smelters, factories, workingmen's settlements, and the highly developed industrial character of the region which surrounded Lens, the great industrial center. The French had a most efficient system of espionage in effective operation and were assisted on every hand by the civilian population.

Early on the morning of Oct 3, the artillery opened fire from Beaumont upon the industrial towns of Henin-Létard and Billy-Montigny, which were still occupied by the enemy. The high mounds of slag near the mine pits and shafts were an important feature of the terrain. These made excellent observing stations. Heavy fighting now developed on the left where the Bavarian Reserve Corps were forcing an advance which

the horse artillery was ordered to support. At the same time the 7th Cavalry Division was ordered to take possession of Billy-Montigny because hostile firing from this town was threatening the rear of the 8th Cavalry Division, which had already pushed on far to the north. One battery was therefore assigned to support the attack of the cavalry division on Billy-Montigny, while the other two batteries were assigned to support the attack of the Bavarians on Rouvroy and Mericourt.

The 1st Horse Battery supported the attack of the Hussars, who dismounted to fight on foot and advanced against Billy-Montigny. The battery took under fire the railroad station and its vicinity as well as the edge of the town. The incendiary effect of the shell soon set fire to many houses. The Jägers who were advancing against the town from the east along the main road found great difficulty in advancing due to heavy small arms fire. One gun of the 1st battery was therefore detached and dragged by hand up on the main road. While under hostile small arms fire it began to clear the road by searching the length of the street with successive rounds at about 1200 meters range. This, together with the fire support of the other guns of the battery against the center, soon enabled the cavalry to occupy the town. The whole battalion bivouacked in the town the next night.

The 2d and 3d batteries had in the meantime been ordered to take position behind the buildings surrounding a mine shaft. An observing station was established on the top of a mound of slag from which steam and smoke were still rising. A beautiful view of the battle area was obtained from this difficult and dangerous vantage point. The Bavarians were just delivering a beautiful infantry attack, while in the distance could be seen very clearly the retreating red-trousered French columns. Haste in establishing communication was urgent. This was finally established and it was possible to get some effective shots into the retreating enemy. Just as the fire promised to be most effective a break in the telephone communications developed. This particular incident and many similar ones emphasize the necessity of greatly improving our system of inner communications. Some means should be provided to carry the reel on the back so that the wire may unreel itself and follow the advancing operator and thus be ready for use at any instant. Upon this occasion the reconnaissance officer was able to observe accurately the strength, composition and direction of retreat of the enemy. He was thus able to make later in the day a very accurate and useful report to division headquarters, which led to a quick decision and more expeditious results than if the delayed reports of the cavalry had been awaited. The events of these days around Lens have impressed me with the importance of such general reconnaissance reports as the field artillery, with its splendid observing instruments, is peculiarly fitted to make.

**FIELD ARTILLERY—Continued**

After a rapid estimate of the situation, I hurriedly descended from the mound, riding forward to select a more advanced position for my batteries from which they might better support the rapid advance of the Bavarians. I was accompanied only by my musician, whom I sent back at the outskirts of Rouvroy with orders to have all the batteries advance along the main road as rapidly as possible. The Bavarian infantry had in the meantime again disappeared from view and I was all alone in the open fields. The only protection for myself and the battalion then advancing directly behind me, was given by two Bavarian infantrymen who had become separated from their company. I pointed out to them several groups of hostile infantry in retreat. After a rapid estimate of the range at about 800 meters they took them under fire and with immediate effect, as I could observe, five Frenchmen being observed to fall in rapid succession. In the meantime the batteries had arrived and went into position in the open, going front into line at a gallop. The guns were immediately concealed by means of brush and sheaves of grain. From this position we continued to fire unmolested on the village of Avion and the neighboring heights toward which the enemy had disappeared. The battalion remained in this position until darkness fell, and then with the entire division went into bivouac in and around Beaumont, from which place they had opened fire on that morning. Every one was dead tired and immediately fell asleep.

The next morning we were to continue the work already begun. The right flank of the Bavarians was to be covered more securely, and to this end as much ground as possible was to be gained toward the north. The 7th Cavalry Division was ordered to cross the highway Lens-Carvin-Lille and also to clear the highway Lens-La Bassée of hostile troops. To do this it was necessary to clear the Souchez Canal and to gain ground to the north. This task was assigned to the 5th Cavalry Division on our right, which in turn was supported on its right by the Guard Cavalry Division at Carvin. Farther to the north was the 8th Cavalry Division. All the cavalry troops in this restricted area were under the command of General von der Marwitz.

Our cavalry division (7th) was ordered first to get in close touch with the Bavarians. Little progress was made because hostile troops were still reported in the big coal mining towns of Sallaumines and Noyelles. We took a position in observation with the batteries while I and my reconnaissance officer rode forward to make a reconnaissance of possible positions. In riding forward through the neighboring villages we were constantly on the alert, expecting every moment to be shot down from some window or dark cellar hole. Upon completion of this reconnaissance, we reported back to division headquarters, where at 10 a. m. we found

every one asleep excepting the officer on guard. It is incredible how much a soldier can sleep in the daytime during actual campaign. Many a soldier has met his death while in the arms of Morpheus. The exertions of the past few days had been so strenuous that even the division commander, usually a very active man, was fast asleep. During the afternoon information was received that the 5th Cavalry Division on our right had succeeded in crossing the canal and we were ordered to move forward toward the town of Loos to support the 5th Cavalry Division. In advancing we were directed to make a thorough search of all industrial villages through which we passed. These formed a very serious obstacle to our advance. In several columns the division passed through the labyrinth of factory and mining towns with the staffs in advance in order to make a timely reconnaissance. At Loison I reported to the commanding general of the 5th Cavalry Division for orders, and he referred me to his artillery commander. The instructions which the latter gave me were to the point and in brevity left nothing to be desired. While awaiting the arrival of my batteries I observed in the distance large masses of French cavalry in retreat across the Lens-La Bassée highway. I called the attention of the nearest battery commander of the 10th F. A. to this target, but he was too slow in changing, not opening fire until the last regiment was disappearing over the crest. In the meantime reports were received from the Guard Cavalry Division, whose action had been responsible for the withdrawal of the enemy along our front. The situation had therefore again changed. Our orders were again brief and still exhaustive, namely to pursue the withdrawing enemy in the direction of Loos. With the 15th Dragoons in front we advanced through the confused mass of buildings and byways of Loison. Riding forward to reconnoiter a position, I saw at about 1200 meters range what appeared to be scattered groups of infantry in disorderly retreat. I immediately ordered the leading 3d battery which was in the advance guard, to advance to the ridge ahead and to attack the target without delay. The battery took a little longer than usual to get into position. This interval permitted my reconnaissance officer to make a closer reconnaissance of the target. This disclosed the fact that the supposed hostile infantry was in fact scattered groups of civilian inhabitants, women, children, old and young men, who with their property on their backs were making every endeavor to get out of the danger zone. Our own cavalry were seen to ride past them in all directions and without firing a shot to gallop on to the ridge in front. I was indeed thankful that the keen eye of my adjutant had saved me and my battalion from another "Belgian atrocity." In other places and under other circumstances, the outcome has unfortunately been quite otherwise. While thus engaged in preparing the order for the next change of position, a factory about 500

meters to our flank suddenly began giving signals with its siren. I immediately sent over a cavalry officer with orders that at the next suspicious sign from this apparently busy factory I would send a few salvos crashing through the place and then hang everyone in it. The message was delivered; the factory thereafter remained silent.

Again we had to advance. To our front could be seen a very prominent ridge which quite naturally suggested itself as the next firing position. While riding forward, a cavalry officer came riding toward me and reported that from the ridge in front a French battery could be plainly seen, standing near a small wood and firing toward the east, from which direction the Guard Cavalry Division was advancing. I rode forward to a small roadside café standing all alone on the ridge. It was, in fact, Ridge 70, on the road between Hulluch and Loos, a hill that became so famous during the sanguinary battles in the fall of 1915. Below us at about 4000 meters range I could plainly see the incessant flashes of a French battery. If we could surprise this battery by an enfilading fire, then just as should have been the case at Moussey on Aug 20, this hostile battery would surely fall as a worthy prize to an enterprising cavalry. While still mounted, I quickly pointed out the target to the battery commander of the 3rd battery and ordered him to take a masked position behind the ridge and to attack the hostile battery as quickly as possible. Along the road and around the house there was a constant coming and going of German horsemen. The other two batteries being with the main body, I knew I had sufficient time at my disposal to make a thorough reconnaissance of the position. The remaining battery commanders and my battalion staff soon joined me and all preparations for the occupation of the position were speedily made. Unfortunately there were too many cavalymen passing and collecting near the house, and this no doubt led to the discovery of our observing stations later on. Near the house were three huge stacks of grain and straw, and these very naturally suggested themselves as concealment for our observing stations. The two remaining batteries were soon in position and ready to fire. For some unknown reason the 3d battery, in spite of its early arrival in position, had not yet opened fire. But I failed to notice this delay and immediately assigned the other two batteries to attack the target. The battery commanders had their stations very close to mine, either behind the stacks about twenty paces distant, or near the house. I directed one battery to open with an echelon fire while the other, taking advantage of the observation of this fire, was at once to bracket with shell and proceed to destroy the battery. Everything went off smoothly, and in a very few minutes it was observed that the hostile battery had been silenced and overwhelmed. We were all very much elated over our success and I had already sent a message to the division commander request-

ing him to capture the abandoned battery, when suddenly a hostile shrapnel burst about 50 paces to my right. The shot came from the left front and was exactly on line with our batteries some 200 or 300 meters behind the crest. Shortly after this we saw the black burst of shell, whereupon a heavy searching fire was directed upon the batteries and our observing stations. This fire did not quite reach the batteries. A few shots did indeed fall close to the guns, but without doing much damage. Up in front, a hellish fire was now being directed against our observing stations. The first thing to catch on fire was the stack farthest to the left due to a direct hit. This caused the horse-holders taking cover behind it to move toward the house for protection. At this moment we discovered one of the hostile batteries to our left front by the flashes of its guns. By beautiful teamwork between the battery commander and the instrument sergeant of the 2nd battery, the fire of this battery was immediately shifted on to the new target; the telephones and detail worked perfectly. Shortly after this another direct hit was made on the next stack on the left and it also went up into flames. The heat was becoming intense. Then a shell burst not five paces from me, detonating with a crash. I thought my head would split, but otherwise I was uninjured. Upon looking around I saw that several members of my staff had been severely wounded. One officer was mortally wounded and died at our feet. Two other officers, as well as several men, were also severely wounded. The first officer, my adjutant, died without uttering a complaint. We dragged his body away from the burning stack to prevent its incineration. Meanwhile the 3rd battery continued its fire on the first hostile battery. During all this time the hostile fire remained undiminished,—on the contrary it seemed to increase in intensity. Shortly after this the battery commander of the 3rd battery discovered strong forces of hostile cavalry in retreat and quickly and accurately shifted his fire to the new target just as if he were solving a firing problem. The telephone operators continued to transmit the firing data with the same accuracy as in time of peace, in spite of the intense heat and smoke and the danger from hostile fire. The only cover they had was a shelter tent which they had spread over themselves as a protection from the intense heat. The effect produced by this rapidly and carefully delivered fire was excellent. The volleys followed at 200 meter increments up to 6000 meters. With the increasing range it was continually necessary to dig down the trails. The 2nd battery also took up this target, but with somewhat shorter ranges, and therefore did not quite reach the retreating enemy. Just before being wounded, one of the officers directed the horse-holders to turn the horses loose, faced toward the position of the limbers. Our good steeds understood the situation and quietly galloped off. With one exception, all were found later with the limbers. At the first opportunity the wounded officers and men were carried to the cellar of

**FIELD ARTILLERY—Continued**

the house, where first aid treatment was given. The conduct of the men who carried them back was intrepid, showing an absolute disregard of the projectiles bursting all around them. No sooner were the wounded safely carried to the cellar than the enemy also began to shell the house. One of our horse-holders and some Hussars were crowded in close to the walls of the buildings. First a shell burst in among these men, wounding our horse-holder and killing several Hussars and their horses, so that the blood literally flowed in streams. Immediately after this another shell came and tore off both the horse-holder's legs.

The third stack now also went up into flames. The telescopes and shields were red hot. Our clothes were also beginning to burn. In addition there was danger of the telephones and the wire being destroyed; in fact, our observing stations were absolutely untenable. Carrying my B. C. telescope over my shoulders I started for the rear, calling out to the battery commanders to close station since it was impossible to hold out any longer on account of the hostile fire, in addition to the heat and smoke from the burning stacks and building. There was nothing to do but to find another observing station. Just at this moment the hostile fire was again opened with renewed energy. I lay down flat in the ditch by the roadside until this hurricane of fire had passed. At this critical moment, our agent with the Division Commander came galloping through this hail of fire with a message to the effect that Division Headquarters wanted to know whether the battalion could stick it out and if not for us to close station. I shouted out to him to get out as fast as he could. Just then a shell struck between us. Upon recovering my senses I looked at the spot where this officer and his horse had just stood. I expected to find his mangled corpse. Upon looking around I saw him a short distance away still on his horse. Again he shouted to me: "Well, what shall I report to his Excellency?" I called back to him: "You just get out; have no fear, we will also get out." The battery commander of the 3rd battery remained to the end and with the assistance of his telephone detail tried to save his instruments and telephones, but to no avail. Everything, helmets, field-glasses, pistols, officer's equipment, even a pair of boots, all were consumed in the flames. Only our dead remained; they had previously been pulled out of the fire.

I now hastened to report to the Division Commander for further orders. Our difficult situation was seen and understood by Division Headquarters. It was, however, necessary to hold the position until dark. I was therefore ordered to go into position again. The whole battalion was then placed in position in a hollow behind a crest farther to the west. In this position it remained until nightfall and continued to fire in the direction from which the hostile firing had been observed, without either the batteries or the observing stations

being discovered. The batteries suffered very few losses from hostile fire in the first position.

The highest commendation is due the assistant surgeon for the prompt and efficient aid which he gave our wounded. In an extended gallop he rode through the hostile fire to the house and was there greeted by our wounded with great joy. It turned out that several wounded French soldiers had also taken refuge in the house even before our arrival. But no one thought of injuring the other. All, even the occupants of the house, did their utmost to give aid to the wounded, the occupants even donating some wine. That night our dead were rescued and buried in a spot that could be easily found later.

Whatever became of the hostile battery which we overwhelmed is a matter of speculation. At nightfall the battalion withdrew from its second position, and by the brilliant glow of the many smouldering fires we marched back to Billy-Montigny, for which both sides had so hotly contested the day before. On the next day, Oct 5th, the battalion was confronted with another sanguinary experience. We forced our way through Lens, and from Oct 5th to 8th fought side by side with the Bavarians on the famous Heights of Lorette west of Lens. In spite of its losses, the battalion was in high spirits and felt that chiefly by its own fire it had compelled the withdrawal of the enemy. This day shall always be a historical landmark in the military history of the battalion.

[The Influence of Artillery in the Present War. Anon. *Memorial de Artilleria* (Spain), Jan, '16. 3000 words.]

That the rôle of artillery has been conceded an increasing importance in all the combatant nations is evidenced by the eagerness with which they have sought to increase this class of matériel and to enlarge the supply of projectiles, turning for this purpose to the expedient of the industrial mobilization of all existing resources, to the creation of new factories and furnaces, and to supply from outside sources. But notwithstanding all the efforts made, it has not been possible to obtain a proper portion of pieces, and the supply of projectiles has not permitted full use of the rapidity of fire possible with modern rapid fire cannon.

The work of preparation and support by the artillery, well done, is of such assistance that the infantry habitually and with reason considers it indispensable. Artillery fire, well directed by proper observation, with an infantry attack directed against the weak points of the enemy's lines, is the most effective means of accomplishing results with small losses.

It is an assistance of which the infantry does not wish to be deprived. Little by little, sharp attacks which do not permit of artillery preparation have been abandoned. The same is true of night attacks in which the period of intensive fire which should precede the assault must be omitted. Daybreak attacks, which also do not conduce to the effective employment of artillery, have continually fewer advocates. Mid-day attacks, which may be



extremely well prepared for by the artillery, offer the additional advantage of shorter hours of daylight during which the enemy may counter-attack. It is true that under such circumstances the element of surprise must be renounced, but the means of defense are so great that surprises can scarcely yield good results.

The importance of increasing the number of cannon, machine guns and rifles on hand; of replacing those worn out, lost and thrown away; of maintaining abundant supplies of munitions, taking into account the enormous consumption and of providing the armies with the supplementary supplies of all kinds, has given rise to a new problem,—that of industrial mobilization.

In France all is working well; the production of supplies and the manufacture of cannon and rifle ammunition is continually increasing. In England it is otherwise. According to *Engineering* in May, 1915, when the daily production of cannon projectiles in Germany was 250,000, the greater part high explosive, England was producing only 13,000 shrapnel and 2000 shell.

[The Day at Lens. By Maj. A. Seeger, 15th F. A., German Army. *Field Artillery Jour.*, Apr.-June, '16. 8000 words, 1 map.]

(Note. An English translation of an article which was originally published in *Artill. Monatshefte*, Jan., '16. See also *MILITARY DIGEST*, Annual, 1916, page 338.)

[Study on the Development of Large Caliber Mobile Artillery, Ammunition and Machine Guns in the Present European War. By The General Staff, U. S. Army. *Field Artillery Jour.*, Apr.-June, '16. 5000 words.]

At the outbreak of the war, two schools of artillery thought had developed. One fostered by the French believed that the low-powered, rapid-fire 3-in. gun with a reasonable supply of ammunition could render heavy or siege artillery powerless; the other headed by the Germans, while assigning a particular mission to the low-powered light gun, believed that it must be supported by heavier howitzers and field guns; the latter, under the support of the light gun again, were to be used to combat the hostile artillery entrenchments, and when necessary, for long range fire. The results of the war have justified the German organization with its preponderance in heavy and long-range guns and howitzers. To this heavy artillery and to its proper handling may be attributed the successes of the German army the first four months of the war. The German heavy artillery with the assistance of aeroplanes succeeded in wiping out whole battalions of the French 75 mm. gun without the latter being able to do them any damage. But by Mar, 1915, French thought had completely veered around to the German idea of artillery, and strenuous efforts were made to supply the known deficiencies.

From the artillery point of view, the lesson to be learned is the same one that has been

taught by every war since the discovery of cannon, namely, the side having the heaviest gun and the best ammunition supply is the one best able to give the proper support to its infantry and, therefore, has the greatest chance for success.

The 6-in. howitzer is by no means the heaviest field ordnance which an army will need in the field. The Germans and Austrians have actually transported 11-in., 12-in., 16-in. and 17.7-in. howitzers, and used them not only for destroying works of concrete and steel, but for destroying field fortifications, supply depots, villages, wire entanglements and other obstacles. To these large guns are due the successes of the Central Powers on eastern front.

It is, therefore, proposed to increase our (U. S.) divisional field artillery from two to three regiments, and the heavy field artillery from one to three regiments with each field army. To supply the necessary artillery matériel and ammunition to equip an army of a million, will cost \$470,000,000, to be expended over a period of eight years.

In spite of the fact that before the war both France and Germany had in reserve 2500 rounds per gun, this has been found to be far from sufficient. The proper reserve supply is now considered to be the amount necessary to wear out the gun. For a 3-in. gun this amounts to about 5000 rounds.

Aeroplanes and stationary balloons or kites are an indispensable adjunct of field artillery. They are used (1) for general reconnaissance work; (2) to discover exposed hostile batteries; (3) to test concealment of friendly batteries; (4) to assist in adjustment of fire.

Reports show that an enormous increase has been made in machine guns. They number now about one for every 30 yards of trench, whereas at the beginning of the war the Germans had 64, the French 66 guns per army corps. In our (U. S.) service it is proposed to supply 18 per regiment.

The success of the 42-cm. mortar has encouraged Krupp's to develop even larger and better calibers. It is now claimed that they have perfected a 54-cm. (21.26-in.) gun, with a range of 38 miles.

The 75-mm. light gun is now seldom used by the French in bombarding field intrenchments.

As a result of the recent army legislation, the regular army (U. S.) will have an effective combatant strength as follows: Infantry, 115,000; cavalry, 35,000; total of the two arms, 150,000. The tentative field artillery organization provides for the following regiments: 10 light field, 2 horse, 4 light howitzer, 3 heavy field, 2 mountain. Computed upon this basis, the strength in guns per thousand combatants is as follows:

	Light Field Gun.	Light Field Howitzer.	Heavy Field Gun or Howitzer.	Mountain Gun.	Total.
No. of guns.....	288	96	72	48	504
Guns per 1000.....	1.92	.64	.48	.32	3.36

**FIELD ARTILLERY—Continued**

These numbers and proportions are far short of those prescribed for a normal divisional organization, for which the regulations prescribe—for the light field gun, 2.74, and for the light field howitzer, 1.37 guns per 1000. It will be noted that the strength of field artillery under the new law falls considerably short of the strength recommended by the General Staff of the Army.

See also

**ARTILLERY—USE OF IN EUROPEAN WAR****—Use of in Fortress Warfare**

[Co-operation of Light and Heavy Field Artillery in Fortress Warfare and Method of Utilizing for that Purpose the Firing Data Computed for Artillery of Medium Calibers. By Giovanni Marietti, Lieut.-Col. of Artillery. *Rivista di Artiglieria e Genio*, Jan-Mar, '16. 10,000 words.]

The extraordinary feats accomplished during the present war in the transportation of heavy field pieces, and the slowness of operations due to the extensive use of fortifications, have obscured the line of separation between fortress warfare proper and warfare around a fortified position. For that reason field artillery must be instructed and ready for rapid tactical operations, and also for the slow operations of attack and defense of such fortified positions.

***Characteristics of Field Artillery and the Resulting Limits of Its Employment***

An explanation of the characteristics of modern material is necessary as a basis for what follows.

Light artillery includes:

(a) Field guns, of caliber about 75 mm., using shrapnel against animate targets and shell against inanimate targets of limited resistance, firing at a rate as high as 15 rounds per minute, traveling readily over ordinary ground, and having a range of 3500 to 4500 meters.

(b) Mountain guns, of caliber from 65 to 75 mm., using the same projectiles as the field guns and almost the same rapidity of fire, but having about 500 meters shorter range, carried on mules, used on difficult ground, and on easy ground with infantry.

(c) Light howitzers, in some armies (German, Austro-Hungarian, and Russian) of caliber about 105 mm., using curved fire against troops behind cover.

(d) Small mortars, abandoned a century ago, but taken up again to-day for throwing projectiles a short distance into trenches, used extensively in the present war.

Heavy artillery is a new species of field artillery developed by the increased effectiveness of hand arms and mounted guns and the resulting use of natural and artificial cover. It was first used in the Greco-Turkish war of 1897 when the Turks had Krupp howitzers of 120 mm. In South Africa in 1899 the English used 127 mm. howitzers and the Boers those of 120 mm., Krupp type. In the Russo-Japanese war, the Japanese used the above sizes at first, but later at Mukden used how-

itzers of 280 mm. caliber, on concrete platforms. To-day we see in use mortars of 305 mm. with motor traction and those of 420 mm. moved on field railways, but these should not be called field artillery. That term should not be applied to anything larger than the 150 mm. howitzer and the 210 mm. mortar.

One of the greatest recent achievements is the construction of the gun of 100 to 105 mm. It is effective against troops on the march or in mass up to 10 km.

The proper use of heavy artillery may be summed up as follows:

(a) Against targets beyond range of light artillery.

(b) Against strongly fortified positions.

(c) To silence the light and heavy hostile artillery.

(d) To join with light artillery in overwhelming fire upon the decisive point of a determined attack.

***Characteristics of Siege and Defensive Artillery***

In the present war, Germany has used not only a large amount of heavy field artillery, but also a very powerful and yet mobile equipment of siege artillery, to reduce the permanent fortifications that she has encountered.

The use of non-recoil carriages, mechanical traction, and caterpillar wheels, has taken from siege artillery much of its former slowness of movement and operation. However, there has been no change in the essential requirements of careful previous preparation and study of the plans for the siege, and absolute accuracy of fire upon the limited targets presented.

The artillery of the defense must have the same characteristics as that of the besiegers. Its weak point is that its fixed position is easily ascertained by the attack, which can then concentrate fire upon any desired point. The remedy for this is an ample supply of mobile troops and mobile artillery. The necessity of thorough previous preparation applies to the defense as well as to the attack, and the former has less excuse than the latter for any failure in this respect.

***Field Artillery in the Attack of Fortresses***

Field artillery has no rôle in the incomplete forms of siege, such as bombardment, blockade, and surveillance, but it plays an important part in the regular siege. It should be assured of the constant co-operation of large units of infantry. In addition to the field artillery, it is necessary to have siege artillery well advanced in order to cope with the opposing heavy artillery. As the attack progresses, the siege artillery covers the strongly fortified points of the enemy's line, the heavy field artillery covers the intervals and the more elaborate field works, and the light field artillery covers the enemy's trenches and his light artillery, facilitates the advance of its own infantry, guards the openings where counter attacks may issue, fires upon moving troops, observers, signal stations, and aircraft, and protects the heavy artillery from sudden attacks. In the final assault all the available artillery concentrates on the critical point, to render the enemy's position untenable and per-

mit its own infantry to act with all its power.

#### *Field Artillery in the Defense of Fortresses*

The defense of a fortress is generally intrusted to:

- (a) The permanent works, a complete circuit or a line of detached forts, with heavy guns protected by armor and concrete.
- (b) Occasional batteries of small and medium caliber in the intervals.
- (c) A reserve of light heavy field artillery and of powerful siege guns.
- (d) A garrison of troops of all arms.
- (e) Finally, large units intended for mobile defense, or forced to take refuge in the fortress.

The great advantage of the defense is that it has time for the most ample preparation. The principle to be followed in the use of the artillery is the division of labor; the field artillery should be used particularly for the support of the infantry, and to relieve the larger artillery of tasks which it cannot perform without detriment to its own peculiar duties.

#### *The Preparation of Firing Data*

Before action begins, all necessary data must be collected to enable the artillery to achieve the general effect in the least possible time. The control of fire involves:

- (a) The delimitation of sectors of action.
- (b) The designation of objectives for various units.
- (c) The transmission of orders for changes of objective, concentration and distribution of fire.
- (d) The proper supervision of the execution of fire.

The data prepared by the fortress artillery proper should be available for the use of the field artillery that may take part in the defense. Even if the field artillery acts on ground outside the fortress, the firing data for such ground should have been prepared in advance by the fortress artillery.

It should be remembered that the defenders of a fortress are generally inferior in number and quality to the attackers, and that the only hope of a successful defense lies in the utilization of all advantages, particularly those that contribute to the effectiveness of the artillery.

#### *—Use of in Mountain Warfare*

[The Use of Field Artillery in the Alps. By Major A. dell'Oro Hermil. *Rivista Militare Italiana*, Mar, '16. 5800 words.]

Up to the beginning of the present war with Austria, the troops used in Alpine operations were always recruited from that section. However, the present very extensive campaign on our northern frontier has made it necessary to use so many troops that men absolutely unfamiliar with the mountains have had to be used there. This has caused them, and very especially the artillery, unusual hardships.

The field artillery has proved that it shares with the mountain artillery the proud distinction of being able to follow the infantry anywhere. In our operations against the Austrians, the field guns have been compelled to take position at points heretofore considered inaccessible. In reaching these points it has

been necessary from time to time to call on the infantry for help, because the guns really had to be lifted almost vertically up the side of the mountains.

During the marches thru the mountains, it has sometimes been necessary for the guns to pass over roads that are impassable for the supply wagons. To provide for the transportation of supplies and ammunition in such cases there have been furnished to each battery of field artillery the following parts of wagons: One iron axle, one seat, two wheels, one towing rope. The other parts necessary to complete a satisfactory wagon may be picked up in any locality.

The weather, where the artillery has been operating, has been very severe. The temperature remained for a long time around twenty degrees below zero. The ground was continually covered with ice. One battery that had been operating against the Austrians for about four months, and which, during the last four nights, had been continually firing on them, was ordered to withdraw from its position. The only road open was by way of the village of Ornella, which had just been set on fire by the Austrians. The reflection from the burning village illuminated the retreating artillery sufficiently for it to be fired on by the Austrians. During this withdrawal the ice on the roads caused one of the guns to get beyond control of the drivers. The gun started down the steep road and was headed directly for the church of the burning village, when some unforeseen obstacles in the road caused it to swerve off into a snowbank. Shortly afterwards I again saw this same battery. The men had been kept marching thru the muddy roads for several days and were all worn out. The horses seemed to have lost their spirit entirely. They resembled a lot of bison, with their long, unkempt manes. The battery and its men reminded one greatly of a group of wandering gypsies. All that was lacking to complete a picture of a gypsy caravan was wagons loaded with women and children. Anyone who had seen this sad spectacle would certainly be impressed with the tragic side of war.

The artillery is called upon to do most of the work of opening a way thru the difficult barrier of mountains on our northern frontier. Before the war the Austrians had seven intrenched camps and ninety-five fortified works on their side of the line. Shortly after the war began, and while Italy was still preserving her neutrality, the Austrian side was further strengthened. Trenches were constructed in every possible place. This great number of trenches has caused an increase in the number of field guns needed by our troops, as the artillery is most effective in clearing trenches.

Most of the training of the field artillery has been for operations in open country, and, naturally, it is greatly handicapped by being forced to operate over the bad roads of the mountains. In spite of this, no complaint is ever heard, for every man is imbued with the one idea of sacrificing his life, if necessary, for the good of our beloved Italy.

**FIELD ARTILLERY—Continued****—Use of in Russo-Japanese War**

[What Use has been Made of the Artillery Experiences of the Russo-Japanese War? By Major General v. Richter, ret. *Artill. Monatshefte*, Nov, '15. 4000 words.]

(Note. Title only. The November, 1915, issue of the *Artilleristische Monatshefte* has never been received. Digest will be given later if a copy can be secured.—Ed.)

[What Use Has Been Made of the Artillery Experiences of the Russo-Japanese War? (Concluded). By Major General v. Richter, ret. *Artill. Monatshefte*, Dec, '15. 4000 words.]

(Note: Continued from *Artill. Monatshefte*, Nov, '15.)

The Japanese made use of partly masked positions, occupied them secretly, and then concealed the guns. In the beginning, the Russians occupied open positions and were overwhelmed. After this they took more cover and when the new matériel was issued, some clever leaders used indirect laying from completely masked positions. The method of laying was rather intricate and caused great objection. This has now been simplified, and the overwhelming advantages of the masked position and indirect laying are now recognized everywhere.

In the present war, batteries in the open suffer enormous losses. Shields give no protection from oblique and enfilading fire. High explosive shell from heavy guns produce great physical destruction in addition to mental depression and collapse. Therefore in addition to natural cover, artificial cover must also be provided, especially to prevent observation from hostile aircraft. But occasions may arise when artillery must not be afraid to suffer losses and take a position in the open when this will lead to a decision in the infantry attack. Upon the choice of the observation stations depends the facility of observation and control of fire. They are the eyes of the battery and are protected against hostile fire and observation.

In reconnaissance, the Russians were stupid and slow; the Japanese were cunning and active. The inefficiency of the Russian artillery was due in great part to this deficient reconnaissance. When ordinary measures failed to give the information, the Japanese compelled the enemy to disclose his position by a reconnaissance in force. After the war, the Russians made great efforts to develop trained scouts and observers, but they have been handicapped by the high percentage of illiterates (75%) among their people. The Japanese were the pioneers in incorporating in their Drill Regulations some prescriptions on reconnaissance. These were copied by the French.

The maximum number of rounds per gun expended in a single engagement by the Russians in 1904-05 varied from 422 to 522. The extravagant expenditure was due to defective ammunition, to the absence of proper reconnaissance, to long range ineffective fire, and to

the destruction of large amounts of ammunition to prevent capture. The Japanese maximum average was from 250 to 280 rounds per gun. The Japanese expended ammunition uselessly by bombarding unoccupied positions.

The French have greatly increased their ammunition supply in the field, and now carry 501 rounds in the firing battery, combat train and ammunition column, which amount up to 1912, exceeded the supply carried by the Germans. At the close of the Russo-Japanese War, General Langlois demanded that 3000 rounds per gun be kept on hand. This is probably excessive. Enormous amounts are being expended in the present war. Reports show that the English land and naval batteries fired 60,000 rounds in one day at the Dardanelles. In September, 1915, the Allies in their great offensive on the west front used 2000 light and 300 heavy guns, firing 900,000 shrapnel and shell. The collection of so enormous a supply of ammunition is possible only in position warfare, and its manufacture is possible only when home ammunition industries are highly developed or when other foreign sources are available.

In the employment of the Russian artillery, there was a total absence of co-operation with the infantry. The Japanese also showed many deficiencies in giving their infantry proper support. The Japanese also developed fire direction by a superior. They always sought to obtain fire superiority over the hostile artillery, not so much by massing their guns, as by concentrating their fire. They supported their infantry as long as possible. This is now also done by the French and the Germans in the present war.

Increased fire effect and stronger field fortifications compelled the Japanese to resort to night attacks. These attacks have been made a matter of instruction and practice by all armies. The artillery has succeeded in working out a method to give effective support for such attacks.

Those nations that carefully studied the Russo-Japanese War and drew the proper lessons therefrom, increased their proportion of artillery. Although the infantry will always be the principal arm, the experiences of the present war show that without the powerful support of the artillery, it could not accomplish its task, or could succeed only after suffering enormous and disproportionate losses. The artillery has unquestionably won back its importance in obtaining a decision in battle.

**FIELD GLASSES**

[Lack of Army Field Glasses. *Army & Navy Register*, Apr 1, '16. 350 words.]

The War Department is filing a requisition from General Funston for 1092 field glasses at \$38 each. It has been impossible to buy field glasses abroad since the beginning of the war, and it is believed that now a satisfactory field glass can be produced in this country. The annual estimate of \$60,000 for field glasses has always been stricken out, with the result that the army is not sufficiently equipped. The

demand for immediate delivery for use in Mexico is urgent, and the order will undoubtedly be placed with American manufacturers.

# **FIELD WATER BAG**

See

WATER SUPPLY—FIELD WATER BAG

# **FIRE CONTROL**

See

FIELD ARTILLERY—FIRE CONTROL

# **FIRING REGULATIONS**

See

FIELD ARTILLERY—FIRING REGULATIONS

MOUNTAIN ARTILLERY—FIRING REGULATIONS

# **FLAME PROJECTORS**

See also

EUROPEAN WAR—MILITARY LESSONS OF THE  
(Article: "Medico-Military Statistics")

# **FOKKER AEROPLANE**

[The Fokker Aeroplane. *Army and Navy Gazette*. Jan. 29, '16. 900 words.]

Those who have been wondering whether England had not lost some of her air supremacy as a result of the great efficiency of the new Fokker aeroplanes of the Germans may find some comfort in the recent report of the Under Secretary for War. This statement says that the new Fokker machine is incapable of prolonged flights. It is, however, very speedy, is easily handled and is used only in defensive aerial warfare. This does not explain why so many recent English machines have been brought down behind the German lines.

These losses need not occasion any alarm, for the Fokker does not appear to be any better than some of the smaller English machines which, like the Fokker, can fire their guns through the revolving propeller blades.

The English losses in air craft are really no greater than those of the Germans, for theirs occur behind their own lines and can be hidden, while the loss of every English machine is widely advertised.

The report tends to prove that most of the air fighting has taken place behind the German lines, that the English have used many more machines and that recently the prevailing winds have been from the west, thus preventing the return of damaged machines. These facts would explain why, in spite of the greater skill and activity of their flyers, the English in the last few weeks have lost 13 machines to the Germans 9 or 11. But the fact remains that the Fokker is a very troublesome enemy and is interfering with the English aerial offensive.

[The Latest Attempt to Challenge British Air Supremacy.—The Fokker Monoplane. *Sphere*. Jan. 29, '16. 400 words. Diagrams illustrating method of attack.]

The Fokker has been quite successful lately. It is a small, high-powered monoplane, speed over 100 m. p. h. and capable of climbing 800 feet per minute. Taking advantage of its speed and climbing power, the Fokker attacks from below and behind. It requires very

skillful piloting, and Germany has not many pilots capable of handling the Fokker. The Allies now have machines superior to the Fokker in speed, climbing power and stability.

[Aeronautics. New Fokker Monoplanes. Note. *Scientific American*. Feb. 19, '16. 200 words.]

The Fokker is designed along the lines of the fast French monoplanes which have proved so effective in the hands of skilled pilots. A special feature of the Fokkers is steel tubing covered with a sort of waxed canvas as a rust preventive. The tubes are rectangular in section with knife edge at the rear. The engine, usually 150 h. p., is armored and gives a speed said to be 110 m. p. h., with the ability to climb 7500 feet in 10 minutes. The machine gun fires through the propeller. Some Fokkers carry two machine guns, each with a belt of 250 cartridges.

[Note. *Army and Navy Jour*. Feb. 19, '16. 200 words.]

British correspondents report that the new German Fokker battle aeroplanes, with 200 h. p. motors, high speed, and armored crew space, have attained a practical mastery of the air. Their guns fire directly ahead. German official reports since Dec. 16, chronicle the destruction of 13 British and 2 French aeroplanes by Fokkers. The Allies will soon have equally powerful machines. The Fokkers apparently came as a surprise.

# **FORAGE**

—For Horses

See

HORSES—FORAGE FOR

# **FORT DONELSON, Capture of**

[Fort Donelson. By A. L. C. *The Military Historian and Economist*, Jan, '15. 10,000 words. Maps. Statistical tables.]

(A résumé of the operations leading up to the siege, and of subsequent events.)

# **FORTIFICATIONS**

See also

BELGIUM—FORTIFICATIONS

Brazil

[History of the Fortifications of Brazil. End of First Part. By Annibal Amorim, 1st Lieut. *Boletim Mensal* (Brazil), June, '16. 4000 words.]

(Fort of Barbalho; S. Marcello; Monte Serrat; Morro of S. Paulo; S. Bartholomeu da Passagem; S. Antonio; S. Laurencio; Paraguassu; Redoubt of S. Luiz, Redoubt of Rio Vermelho; Fort of Santo Alberto; Jequitiaia.)

—Field

See also

BARBED WIRE ENTANGLEMENTS

ENGINEERS — FIELD OPERATIONS — GREAT

BRITAIN

ENGINEERS—INSTRUCTION AND TRAINING  
ENTRENCHMENTS

—Field—Experience with in European War

[The Development of Trench Warfare in

**FORTIFICATIONS—Continued**

France. Illustration, with note. *Sphere*, Nov 20, '15.]

Not only has an armored helmet been adopted, but there is also a tendency to use steel plates for protection in the trenches. The Germans use a small steel cupola of revolving type, and metal shields are also used.

[How Australians Fight: Changes in Military Training. By Chaplain J. Green, Australian Imperial Force. *Australian Mil. Jour.*, Oct, '15. 1700 words; 9 photos.]

The present war is not being fought on South African lines, and the home training of troops should be under an officer of extended experience on the Gallipoli Peninsula.

So far as the infantry is concerned, all fighting soon becomes trench fighting. The trenches are 8 or 9 feet deep and 3 feet wide at the bottom, with bomb-proofs at intervals and ledges about 3 feet from the bottom for the men to stand on when firing. Trenches are zigzagged, with frequent traverses. Head cover should not taper at the top, but should be 3 sand-bags, or  $3\frac{1}{2}$  feet of earth, thick. Loop holes should have wide angles of fire. Communicating trenches should be wide enough to permit passing each way; bays being constructed at first, if time presses.

Men with experience as miners are especially valuable, as they understand the use of explosives and the building of saps and trenches.

Prior to service at the front, troops should be carefully trained in the use of the bayonet, in the handling and throwing of bombs, in the use of field glasses and the periscope, and in sniping.

Machine guns must be absolutely concealed and fire only at clear targets. They are placed on the flanks, or in rear when the ground rises so as to allow them to fire over the infantry lines. Two machine guns per battalion (1000 men) are not nearly enough.

Respirators, for protection against gases, are issued to men in the defence trenches and steel helmets should be issued in the same way.

Photos show the use of enormous quantities of sand bags.

[An Infantry Division in the Trenches. By Captain X. Translated from *L'Illustration*. *Infantry Jour.*, Jan, '16. 3000 words.]

France knows little of the new manner of living of her sons, intrenched along a 1000 kilometer front from the North Sea to Switzerland.

My division occupies a sector retaken from the enemy; its achievements have been mentioned in orders, and several of its colors have been decorated.

The holding of conquered lines is more costly than the assault to gain them. The destruction commenced by our own artillery has been completed by the enemy. We must first dig in and organize. Trenches are reversed, sand bags and debris of houses and trees are used. In two days the worst is done, and the trenches are tenable.

Work is only possible at night and is systematized from this point on. Second line trenches, zigzags, shelters, firing trenches, advanced trenches, support trenches, to the extent of forty kilometers over a very short section of line, require the excavation of immense quantities of earth. A good trench requires depth, parapet and banquette to furnish concealment, protection and accuracy in firing. Accessory defenses in front of the trench and minor installations within are absolutely necessary to a degree not contemplated one year ago.

Rain is the worst enemy. It crumbles the walls of the deep trenches, some being 30 feet below the surface. To keep the trenches in condition, the walls are revetted with hurdles and gabions, even movable wooden floors are used. Work near the enemy is really a little easier than farther back, since his artillery fires upon the latter trenches. One shovelful thrown upon a parapet during the day is sufficient to draw fire.

The shelters of the first line do not shelter against the 105's, 150's or 210's. Further back, these trenches are sufficiently strong. Some shelters are in cellars. The division telephone system, connecting all organizations, etc., requires 125 miles of wire. The sector is a small world for the officers and men. Trenches and zigzags are named for deceased officers, and signs at crossings evoke cherished memories.

The infantry division in the trenches is divided into first line and reserve. One-third of the former may be four kilometers in rear of the firing line, in cantonments, where they are practically never fired upon. The troops in the trenches are exposed to the hardships of night attacks and attack by bombs, but not to artillery fire. The supporting troops, subject to this fire, often lose more than their comrades in the first line. All these duties are equally divided. Out of every twelve days, a company of the first line regiment spends three in front of the Germans, three in a cantonment exposed to fire, and six in a quiet cantonment. These twelve days are followed by twelve days in the reserve, making ordinarily this roster: three days on the alert, six days in danger, and eighteen days in security. Day time is generally quiet. At night, nobody sleeps quietly, everyone being more or less on the watch. All troops—engineers, territorials, and cavalry—take part in the arduous work of sapping. The artillery is practically continuously on duty, due to its heavy work and its small numbers. They fire as a result of their own observation, and also at the request of the infantry.

The rest period is moral, not physical. Drills, bomb practice, a daily practice march of ten miles, or a daily combat exercise of company, battalion, regiment, or brigade accounts for the incomparable fighting qualities which our troops have acquired during fourteen months of war.

A division is morally like a person. It has its physiognomy, its pride, its spirit, its traditions. Each unit prides itself upon heroic acts, which in turn become living sources of

emulation. The recruits imbibe from their elders the morale-stiffening recitals of the divisional exploits, and the division becomes a living sentient being.

The war has given the infantryman a habitual impassivity on the one hand, and an instructive initiative on the other. His courage is not the result of inexperience or temerity. He is calm and well poised, well aware of the dangers, but trained up to reason and to judge. The heroic minute when the attacking units spring from the trenches at the signal of their officers is awaited with such self-sacrifice that at any other time you would kneel before them. With the full knowledge of duty and peril, these heroes coolly spring from their shelters to face death for their country.

[The Problem of the Western Front. III—The Actual German Trench-Fort System at Tahure. Illustrated on a Unique Document of the War. *Sphere*, Feb 26, '16. 2100 words. One map, 6 illustrations.]

(Note: There is published in connection with this article a contoured map on a scale of about one inch to the mile, representing an area about twenty miles front and five miles depth, showing in detail the German defenses from Aubérive-sur-Suippes to Massiges. In the center of this front are Souain and Tahure. This is the scene of the September drive by the French, and represents the portion of the German line captured at that time. The German trenches are shown in detail for both first and second lines. The French trenches are omitted. The position is described sector by sector, followed the French report, from which the map is taken. Obviously no detailed description can be given without the map. From the map and the description given, the German position occupied generally the forward slope of the ridge between the Suippes and Py rivers in the western half and between the Tourbe and the Dormoise in the eastern half. There were two lines of defense.

The first line comprised first a continuous trench covering the whole front. This continuous trench was backed up for distances of two to four miles of front by tremendous aggregations of trenches, spoken of in the description as comprising as many as six complete lines of trench. Communicating and cover trenches served to complete a maze of trenches, the actual purpose of which in all cases is not apparent on a map of this scale, on a contour interval of 20 meters. However, the front consisted of a series of defensive areas two to four miles front by about one mile depth, separated by intervals one to two miles in the re-entrants in which the defensive organization was comparatively simple, consisting of only one or two lines of trench. In these defensive areas the French attacks encountered desperate resistance, so that in general the attack was broken up and came to a standstill against the second line.

The second line was comparatively simple and consisted of a practically continuous line

with but little organization in depth. It seems to have been amply protected by barbed wire.—Ed.)

"The importance of the chart lies in the manner in which it brings out the German system of forming strong redoubts which become centers of continued resistance even after heavy bombardment and the first rush of attackers. \* \* \* It is not possible to show the barbed-wire system as well as the trench system on this one chart, as the result would have been too complex and would have led to confusion. It may be said in brief that each of the parallel trenches is generally separated from its neighbor by long avenues of wire measuring from 15 to 60 meters across.

"The chart clearly reveals the second line on higher ground before which the attack died away."

Field railways served both the first and second lines by spurs from the main railroad in rear.

[The European War. Attack on a Fortified Position. Translated from *De Militaire Spectateur* (Holland), *Revista Militar* (Argentina), Apr, '16. 2000 words.]

The defensive position having been developed, the attack takes two distinct phases:

1. The struggles for fire superiority.
2. The infantry assault.

The struggle for fire superiority is made almost exclusively by the artillery. The artillery exerts its full power to annihilate the hostile artillery and infantry. During the bombardment, the infantry endeavors to approach the position. This is generally accomplished at night. Success or failure depends upon the intensity of the enemy's fire, and upon the measures taken for artificial illumination of the front. The attacking infantry entrenches close to the enemy and waits until daybreak to assault. Hand grenades, bayonets and knives are the weapons used.

Engineer patrols precede the infantry to cut openings in the entanglements. During the assault, the artillery increases the range and delivers a curtain of fire to the rear of the position. This prohibits the defenders from bringing up reserves. This fire is called "baricading fire." It continues without interruption until the attackers have organized the captured position for defense or, in case of defeat, have effected a withdrawal.

Before the present war, it was generally thought that the object of infantry fire was to obtain fire superiority over the hostile infantry. Recent experience teaches that it is rarely possible for the attacking force to get fire superiority by the use of infantry fire alone. The enemy is usually protected by covered trenches—not even a head is exposed. The support of the artillery and machine guns is more necessary now than ever before. The adoption of the offensive implies a preponderance in these arms. The measures open to the infantry to diminish losses are an intelligent use of the ground, proper formations, and rapidity in all movements. Infantry cannot spend too much time in this class of training.

**FORTIFICATIONS—Continued**

The moral control of officers and non-commissioned officers is now more necessary than ever to maintain discipline and counteract adverse influences. They must learn that needless exposure to danger is a grave fault. The belligerents on both sides have given special instructions with reference to firing at leaders.

Platoon and squad leaders who expose themselves to animate their men use antiquated methods. They should remain in line with the men during the assault. We have information from reliable sources that German infantry officers do not precede the troops when advancing to the assault, but all advance in the same line. The officers generally carry rifles. The use of distinctive uniforms by officers during battle is no longer favored by the Germans.

In peace-time maneuvers we have exaggerated the activity of platoon and squad commanders in conducting the fire of their units. Under actual conditions these commanders cannot move about from place to place to correct elevations and give instructions. The method of transmitting orders by passing them along the line orally from man to man will not work in battle. Orders sent in this way do not get farther than the first two or three men, even when they are properly understood by the first man, which is not always the case. We may as well realize that in modern combat the rifleman must be left largely to his own initiative.

Charges which start as far as two hundred meters from a position held tenaciously by the defenders simply invite disaster. Fifty meters is a better distance from which to start the charge. When the position is not penetrated, the assaulting troops must hold the ground gained. An unsupported withdrawal means annihilation.

The use of hand grenades is constantly increasing. At some points the fighting is done almost exclusively with them. The best grenades are those made of preserve tins filled with dynamite, surrounded by bits of projectiles, and provided with a short fuse and a fulminate of mercury detonator. Each soldier carries six grenades to the attack. The grenades explode seven seconds after being thrown. The belligerents now instruct recruits in the use of grenades, the following method being in general use: The recruits are provided with dummy grenades and take the prone position. At the instructor's signal they rise quickly, dash forward forty meters and throw the grenades thirty meters at a mark three meters wide. The course takes four days. When loaded grenades are used, suitable cover is provided from which they are thrown.

**—Field—For Artillery**

[Fortification for Field Artillery. By Eugene I. Rottjer, 1st Lieut. of Artillery. *Revista Militar* (Argentina), Mar, '16. 2300 words.]

A discussion of methods employed in fortifying a battery of 7.5 c.m. field guns.

The Field Artillery Regulations designate

two classes of field works, viz: emplacements on the surface, and gun-pits.

The spade work is very fatiguing. When practicable, drivers of the lead teams take charge of the teams, and the other drivers assist in fortifying the position. Four shovels and two spades are carried on the gun and caisson. Six men per gun entrench the piece, working in ten-minute reliefs.

To construct the emplacements, the battery being in position, with intervals of 20 paces between guns, the battery commander orders "*Magistral*." The gunners, under the direction of the chiefs of sections, draw the magistral lines, using a shovel length as a unit of measure. At the order "*Trasado*," the gunners trace the works. When this is completed the captain orders "*Al Trabajo*," and the digging starts. The section leaders supervise, the captain occupying himself with his other duties as battery commander. Numbers 1 and 4 construct the front parapet, making it the height of one shovel handle. Numbers 3 and 6 construct the flank parapets to the right of the gun and left of the caisson, respectively. The flank parapets are one shovel length plus half the length of the shovel handle in height. Numbers 2 and 5 loosen the soil with the picks. Sod, brush, branches, etc., are used to conceal the parapets.

Gun-pits can be made in two hours, provided that the work is systematized as indicated. In this case the pits are completed before the guns are put in position. The method given is similar to that shown for constructing emplacements. The battery commander, having started the digging, establishes his observation stations and puts into effect the following operations, which are cited in the order of their importance.

- (a) Clearing the field of fire.
- (b) Measuring ranges.
- (c) Removing objects which might serve as observation or aiming points for the enemy.
- (d) Eliminating dead spaces.

To clear the field of fire is of primary importance. Clearing is done up to 700 meters against infantry, and up to 2500 meters against artillery. Range marks are placed at distances of 1000, 1500, 2000 and 2500 meters; these must be invisible from the front.

With reference to preparations for fire, a panoramic sketch of the position is made; also a sketch of routes available for advancing and withdrawing.

An abundant supply of ammunition is placed in the entrenchments in suitable receptacles near the guns. Possible hostile positions for artillery are located, and the necessary firing data secured. The field of fire is cleared and the communicating trenches are made by the personnel of the baggage section.

**—Field—Obstacles**

See also

**BARBED WIRE ENTANGLEMENTS****—Field—Use of in European War**

[The German Trench-Fortification System Captured by the British in Their Advance North of the Somme. *Sphere*, July 22, '16. 200 words.]



(Map reproduced by courtesy of *The Times*. Drawn from official map published July 18.)

Commenting: "The above map clearly shows the elaborate network of trenches immediately behind the first line, and the comparative simplicity of the second line of defense. In the first line fire trenches, communicating trenches, mine craters, and barbed wire entanglements all combine to render the defenses extremely strong. In addition to these, the villages and woods are converted into formidable redoubts linked up to the trench line; the general contour of the country is also employed to lend strength to the system. The second line, however, seems curiously simple by comparison with the first. The trenches are guarded by barbed wire impediments, in places by a double line of these; but apart from the entanglements, there seems little effort made to secure a more worthy line of defense. The second line was, however, very firmly held—probably by quite fresh troops in large numbers. The system illustrated in the map finds its highest expression in the fortified villages and woods."

[Notes on the Use of Field Fortification. By Capt. Gualberto Favini. *Riv. Mil. Italiana*, June-July, '16. 11,000 words.]

The German front line in Belgium and France contains a salient of almost a right angle with its vertex always pointed threateningly toward the French capital. To the west of the salient the country consists of various plains and river valleys, well supplied with communications. On the other side of the salient the country is more broken and wooded, with fewer communications.

The object of the Allied offensive at the end of Sept, 1915, was to capture some of the territory east of the salient and interrupt some of the German communications. The success of the operations would have forced the Germans to retire from a good part of the territory they had held.

After a most intense artillery preparation, the attack began on the morning of Sept 25, 1915, and was aided by the English fleet and by airships of both nations. Except for a few points of small resistance, the attacks of both English and French were completely arrested in a short time. In spite of the great efforts made and the enormous losses suffered, the results were merely the conquest of a few square kilometers of ground. A German report of the battle states that at two points the Germans fell back "from the first to the second line, which is not the last."

The time for the attack was well chosen, considering both political and strategical reasons. A successful result would have relieved the pressure against the Russians, prevented the Austro-Germans from massing on the Serbian frontier, and persuaded the Bulgarians to emerge from their neutrality.

The preparations for the offensive were made with great care and elaboration. It was estimated that the Allies had one cannon for every ten meters of front. They used a much greater density of troops than had been used in previous attacks. The artillery prepara-

tion lasted about a month and was intended chiefly to shake the nerves of the enemy and bring out the positions of his heavy artillery. Prior to the assault there was a continuous destructive bombardment for three days and nights by guns of all calibers, which gave the enemy no rest and no opportunity to repair damages. Six million shells were used during the three days. Great damage to the German trenches was effected; many of the defenders were killed; those who tried to escape were caught by shrapnel; many of those who remained in the trenches had no food for 48 hours.

The causes of the small success of this offensive were heavy rains, muddy ground, obscure atmosphere, and the heavy packs carried by the men. In addition to their arms, ammunition, and intrenching tools, the men carried two days' rations, sand bags, hand grenades, and coils of barbed wire. In spite of this burden and the muddy ground, several thousand of these men covered four kilometers in an hour. Co-ordination of the different parts of the assaulting lines was not maintained and the actions were isolated and fragmentary. The successes were confined principally to the capture of first line trenches; the second line had not been seriously affected by the artillery fire and was too strong to be taken. It is probable that the Germans had a third and even a fourth line ready for resistance.

The Germans have followed the policy of occupying a large amount of hostile territory, not only to gain military and political objectives, but also to have behind them a large area over which they can withdraw slowly when forced to the defensive without allowing the operations to reach their own territory. They propose to make up for their scarcity of men by the use of fortifications and automatic arms. Their defenses will not be of the nature of permanent fortifications, but rather of intrenched camps, protecting important stream crossings and centers of communication. It is not necessary that such defenses shall be placed on elevated ground; strong defenses can be established on level ground, without knolls from which hostile artillery commanders can direct their fire, but having woods to serve as a screen against aviators.

The *Leipziger Neueste Nachrichten* of Sept 26, 1915, referring to the Allied offensive, says: "If Joffre forces us to take a new position, we know that *with the work already completed*, behind every obstructing rock another rock will arise, behind every wall another wall, behind death more death." This is taken to refer to work done far behind the battle lines, with civilian labor; it is foolish to suppose that the Germans have prepared defenses in front and have neglected to build them at the rear. Against such preparations the Allied offensive undertaken in the fall of 1915 is absolutely insufficient. Before discussing the proper form of attack it is necessary to consider the nature of the German defenses.

**FORTIFICATIONS—Continued**

In each defensive position there are at least two and possibly in some cases five lines of trenches, connected to each other and to the rear by subterranean communications, and flanked by cross and oblique trenches prepared to fire in either direction. The strongest trenches are those farthest from the front. This was shown at Loos, where the first two German trenches were taken with comparative ease, but the capture of the third was much more difficult because it had not been injured by artillery fire and its defenders were ready for resistance. The first line trench is of an improvised and open type, while those in rear are elaborately revetted and covered. Likewise, the entanglements at the front, constructed in contact with the enemy, have to be incomplete, while those in rear are built with greater care.

A new development is what may be called a *movable trench*; according to a photograph published in the *Domenico del Corriere*, Dec. 19-26, 1915, it consists of a steel shield protecting five or six men and traveling on a four-wheeled carriage capable of adapting itself to the inequalities of the ground.

In Champagne and Artois the Germans have constructed shelters 18 m. below the surface of the ground, in unusually favorable earth. These shelters are sometimes placed under the trenches, and serve as countermines or listening posts. They have proved to be traps for many troops, both German and French.

The great strength of field fortifications to-day comes largely from their low visibility as targets, whereby they force the attack to obtain with volume the effect formerly obtained with accuracy of fire.

To compensate for a scarcity of men the Germans make use of a great number of automatic and machine guns. It is estimated that on the French front they have one machine gun to every ten or twelve meters of front. It is evident that a line thus strongly held cannot be captured unless use is made of mobile protection, for the attacking personnel or the hostile trenches are overwhelmed with high explosives, liquid fire, and asphyxiating gases. The offensive is still the way to achieve victory, in spite of the changes in methods produced by the present war. The solution of the problem must be sought in the development of mechanical means to supplement the moral and material forces of the offensive.

From the very beginning of the war the Germans, imitated later by the French and English, attacked with masses of infantry, in successive waves, but the result was merely useless slaughter. Attempts were then made to protect the assaulting troops with metal shields, but they did not have sufficient resisting power to turn bullets. The next step was underground warfare, with bombs and grenades. The results obtained with this method of warfare were very limited. This was followed by the development of massed artillery, fire, preparing the way for infantry

in phalanx formation. It was found that the artillery had a limited effect on the front trenches and did no great damage to the strong trenches in rear; at the same time it required an enormous expenditure of ammunition.

The remedies for the difficulties enumerated are believed to be as follows:

(1) Rapid-fire guns and artillery of medium calibers must approach close to their particular targets so as to gain important results in a short time with economy of ammunition.

(2) The so-called artillery of the trenches can be discontinued.

(3) The problem of mining operations is more difficult to solve; it depends on the development of a noiseless boring tool.

(4) The mobile protection for the attacking infantry must be perfected. The most recent and important development is the use of armored automobiles by the Germans on the Russian front. They are referred to in the Russian official reports for Dec 31, 1915, and Jan 2, 1916. These experiments were evidently isolated and incomplete, but they show what the Germans have in mind.

The same idea has been under consideration among the Allies. The *Corriere della Sera* of Nov 29, 1915, quotes a colonel of the Italian general staff as saying that some mobile protection is necessary to permit troops to advance in relative security. The requirements are that the machine shall be completely covered, shall have sufficient height to protect men standing, shall adapt itself readily to the ground, shall have appliances for cutting wire entanglements, and shall have powerful arms for the destruction of the defenders of the hostile trenches.

Such a *serpent-tortoise* should be able

(1) To capture with ease and with a certain rapidity successive lines of trenches.

(2) To render useless the counter-assault, which generally succeeds because the attacking party has not time to organize the captured trenches.

(3) To prevent the exhaustion of the men and munitions of the attacking line and thus enable the attack to take on a greater depth.

There is no doubt that such machines will be expensive, but the expense will be more than balanced by the lives they will save.

**—Permanent**

[Some Ideas on Future Fortification. By Don Joaquin de la Llave, Captain of Engineers. Spanish Army. *Memorial de Ingenieros*, Madrid, Dec, '15. 2000 words. Illustrations.]

Although the majority of the technical journals of Belgium, France and Italy have ceased publication since the beginning of the war, numerous articles of value have been published in regard to fortification. Those appearing in the public press may, however, generally be rejected as biased or of little value.

There are two general systems of providing against the action of artillery attacking a defensive work—either to shield the vital parts

by sufficient cover to resist the burst of heavy shells, or to separate the elements of defense so as to reduce the probability of serious damage to any considerable number of these parts simultaneously. The first is that instinctively adopted, but, in proportion as the power of artillery is increased, the second must be adopted.

In the present crisis the limit of power of offensive weapons has not been reached; although, by the methods advocated by Colonel Marrullier of the Italian Army to increase the thickness of parapets, etc., means might yet be found to afford complete protection. On the other hand, to counteract the enormous increase in offensive power, a point may be reached in strengthening fortifications, such that a further advance in this kind of defense is impossible. It may be noted here that Brialmont was greatly surprised, soon after the publication of his book on *La Fortification du Temps Présent*, to find that he was greatly in error in remarking that *the means of attack probably could not advance beyond the point then reached*.

The tendency to dissemination in permanent fortification began in 1885, after experiments by Van Sauer and Mangin, who demonstrated the effect of high explosive shell and advocated very small armored forts. From these experiments and those of other French officers arose the system of small, isolated forts, heavily armored and united by a belt line railroad, on which ran trucks carrying heavy guns. Later this system was adopted by the Germans at Metz. Thus it is seen that the teachings of the present war are in line with the evolution of recent years.

Colonel Voelki bases his calculations on a firm belief that it is not necessary greatly to increase defensive means; contending that analogous conditions obtain for the attack and defense; and that small forts with movable heavy artillery form a correct defense. This principle relies upon the small size of targets and the consequent difficulty of hitting and destroying them; and thus discards the idea of utilizing heavy centers of passive resistance except when absolutely unavoidable.

An anonymous article in the *Kriegstechnische Zeitschrift* proposes a typical work, to fulfill the following conditions:

- 1st. Efficacious fire against the attack until the last moment.
- 2d. Support to neighboring works with defiladed guns under cover to sweep the intervals.
- 3d. Protection against assault.
- 4th. Disposition such that, if the enemy occupies part of the line, he cannot maintain himself against counter attack.

These conditions are obtained by successive lines and a development of the front to the maximum permitted by the terrain. There should be a first line of continuous trench *en barquette*, supported by small armored forts—all in front of the main line of obstacles of every description; and behind this are placed the main lines, consisting of small works for rapid fire and heavy guns under cover of a

heavy mass of concrete, in rear of which another defiladed line of the same character covers the intervals and supports the works in front. The gorge is closed and the entrance is through a subterranean passage.

Frobenius believes that the fortified places that have been captured during this war may be placed in three groups—those that capitulated after a brief bombardment, those that were evacuated without resistance, and those that surrendered after a siege of 7 to 12 days. The first were taken by storm on account principally of the superiority of the attacking artillery, which occupied good positions and fired effectively on visible and well-defined targets without interference. The second group, although abandoned without resisting, would have suffered the same fate had they held out; while the third suffered from lack of offensive initiative on the part of the garrisons, though also in these cases the artillery preponderance greatly favored the Germans. Others, such as Toul, Verdun and Belfort, have survived because the mobile armies have co-operated in their defense by taking advantage of all the accidents of the terrain to construct advanced lines, such as above outlined. Still others, such as Paris, Przemysl, Cracow and Koenigsberg, have assisted the field armies with their garrisons.

From these cases it may be deduced that the enemy must be held at a distance, and that a large target must not be presented to him. The first is obtained by providing the forts with high power heavy guns for grazing fire to oppose vigorously the large caliber guns employing high angle fire, the only class that up to date has sufficient mobility for siege trains. And to avoid the destruction of the works the thickness of armor and concrete cannot be much further increased, but the field fortification system must be used; that is, the elements must be disseminated and a close co-operation with the field army must be maintained, while the latter, resting on the works, must not interfere in the zone of action of the garrison.

An author signing himself J. N. has published in *La Nature* an article in which he proposes to organize systematically in time of peace, generally at highway crossings, intrenched camps modelled on the plan here outlined. In order to avoid the danger of attack from the rear, the depth should be from 10 to 20 kilometers, with from 32 to 64 kilometers perimeter.

In an article published in the December number of *Rivista d'Artiglieria e Genio*, Colonel Emilo Marrullier of the Italian engineers presents two propositions: one purely technical and the other tactical.

He proposes:

- (a) A line of auxiliary defenses, held by infantry and small caliber artillery;
- (b) A line of isolated turrets, separated by 30 to 40 meters;
- (c) A line of protected storehouses, to supply these turrets, 50 meters to the rear;
- (d) A line of shelters for personnel and matériel, 150 to 200 meters from the turrets;

**FORTIFICATIONS—Continued**

(e) A network of communicating trenches for every purpose in rear and between the lines.

This general plan conforms to what appears to be necessary for future fortification.

Other writers agree in general with these ideas. All insist on an intimate co-operation between garrisons of fortified places and the field armies, so as to prepare for the latter an advantageous field of battle. On the defensive the problem is to secure protection against the transportable heavy artillery of the assailant. The idea that permanent fortification is a thing of the past is fallacious. On the contrary, the correct tactical employment of troops still requires the support of fortified places; and a proper use of these points of support embarrasses the enemy and increases the power of one's own troops.

[Influence of Forts and Fortified Cities as Distinguished from Entrenched Areas Upon Operations on Land. General Staff, U. S. Army. *Field Artillery Jour.*, Apr-June, '16. 3000 words.]

The Belgian fortifications of Liège, Namur and Antwerp were all designed by Brialmont and were all similar in design, consisting of a circle of main forts of low relief, built of concrete or masonry, surrounded by a ditch, the mound being pierced by circular pits in which the cupolas or gun turrets move up and down. Each of these forts contained a garrison of 80 men, and an armament of two 6-in. guns, four 4.7-inch. guns, two 8-in. mortars and three or four quick-fire guns, the total being 12 forts with 400 guns for Liège, approximately the same for Namur, whereas Antwerp was encircled by twenty permanent forts and twelve earthen redoubts. The garrison at Liège was probably only 20,000. The Germans numbered 30,000, and opened fire on the southeast sector on the night of Aug 4-5 with field guns. These forts were silenced on Aug 5. On Aug 6, the Germans brought up their 8.4-in. howitzers and 11-in. mortars. It is said that these shells went thru 12 ft. of concrete. The firing was so accurate that on Aug 6 the Belgian field force was withdrawn, the Germans occupying the city of Liège and all the forts except the northern ones. These the Germans left in place until Aug 13, when the 11-in. mortars opened fire again, causing such destruction as to lead to the surrender of all on Aug. 15.

The garrison of Namur, numbering 26,000, had hurriedly strengthened their defenses by throwing up intrenchments and wire entanglements in the intervals. A vigorous defense was intended and French support was expected. The Germans brought up 32 modern siege pieces, including the 42-cm. howitzer and the Austrian 12-in. mortar. These were placed three miles from the Belgian lines. The attack began Aug 20. On the next day two forts fell, three were silenced after an attack of two hours, while the Belgian field forces in the advanced trenches were compelled to withdraw, due to their inability to

reply to the German fire. On Aug 23, Namur was occupied; the last fort fell on Aug 25. One fort had fired only ten times, but was itself struck by 1200 shells, fired at the rate of 20 per minute. The speedy fall of Namur completely upset the Allied plans and made it impossible to complete the concentration for a resistance along the Belgian frontier.

The fortified places—Lille, Laon, La Fère and Rheims—fell before the advancing Germans without striking a blow. The German advance was on such a broad front that an attempt at defense would have endangered the safety of the garrisons, and it was imperative that they join the field armies. By Aug 28, only Maubeuge still held out. The defenses of this place had been brought to a high state of efficiency. It was invested by German infantry on Aug 27, but the German siege guns did not go into action until Sept 3. It fell on Sept 8, with a loss of 40,000 men.

The garrison at Antwerp profited by the fate of Liège and Namur and made a great effort to keep the enemy's heavy siege howitzers beyond range of the forts. The Belgians were, however, driven back by superior German forces, and the siege guns soon demolished the outer forts, depriving the Belgian field forces of the support of its larger guns; and being poorly intrenched and unable to withstand the hostile artillery fire, they were forced back to the inner line. This permitted the German siege guns to come within range of the city, which was then abandoned to prevent its destruction.

At Verdun, however, with a ring of forts five miles from the city, the French have been able to hold on, because, with a field army making use of strong earthworks, the fortified zone has been so largely extended that the German howitzers have been kept six miles from the forts. The unfortified city of Nancy has likewise withstood several heavy attacks, because it is protected by a field army on the hills forming the "Grand Couronné."

The Russians invested the fortress of Przemyśl on Sept 22, 1914, but later the siege was raised, and on Nov 22, 1914, it was invested a second time. As the Russians had no heavy siege guns, the siege resulted in an attempt to starve out the garrison, which plan succeeded Mar 22, 1915. When the Teutonic allies returned in May, 1915, the place fell in 20 days. The Russians say this was due to their low ammunition supply, but the real cause was no doubt the pressure of heavy siege guns with the Germans.

The fortresses guarding Warsaw and the Russian frontier were quickly taken in the Teutonic advance of 1915, either by maneuvering the defenders out of their fortifications or, as at Novo Georgievsk, by shattering them with the heavy siege guns. The fortress of Ossowetz on the Niemen-Bohr-Narew line had a different history. Ossowetz stands on the east bank of the Bohr River, along a ridge covered with woods, affording good artillery positions which commanded the opposite bank, where positions were poor. There were extensive marshes along the river which in win-

ter were frozen over. The Germans first tried to turn the position, but failing in this, brought up their heavy siege guns. The Russian batteries were, however, so well concealed that they suffered very little damage and succeeded in silencing several German batteries. As the warm weather advanced, the marshes made it difficult for the Germans to emplace their guns. Ossowetz, altho first attacked in Feb, 1915, did not fall until Aug 22, 1915, in the general retreat after the fall of Warsaw.

The failure of the forts in the present war is due to several causes:

1. Their location and details of construction were known some years before the war, and guns were especially designed to destroy them.

2. Their armament was not up to date and therefore easily overpowered by the latest types of guns, the existence of which was unknown to the defense.

3. The garrisons permitted the enemy to emplace his guns within effective range, but beyond the range of the guns of the defense.

4. The advantage of concealment as a defensive measure is illustrated by the operations against Ossowetz.

5. The advantage of keeping the enemy at a distance is illustrated by the operations around Verdun and Nancy.

The experiences of this war confirm the conclusion reached during the siege of Port Arthur in 1904, that the mounting of large-caliber guns in a fort for use against siege guns of the enemy is a fatal error.

A modern fortress should consist of a large area, so organized as to insure extreme mobility to troops and guns. Concealment is all important. Permanent gun emplacements should therefore be constructed only at important points, with the primary intention of delaying the enemy in bringing up his heaviest siege guns. The main reliance should be placed upon mobile guns, some of which should be at least as powerful as any which the enemy can bring up. These mobile guns should be located in earthen emplacements, well concealed from hostile observation. Unless the garrison is strong enough in both mobile troops and mobile guns to prevent the enemy from coming within effective range of his objective, then there is no hope of offering a prolonged resistance. Consequently, entrenched areas with mobile troops and mobile guns are a more dependable protection than a stereotyped system of permanent forts.

#### —Permanent—Armored Turrets

[Heavy and Elastic Turrets for Guns of Medium Caliber as a Protection Against Heavy Mortars in Fortress Warfare. By E. Marrullier, Col. of Eng. *Artill. Monatshefte*, Sept-Oct, '15. 6000 words, illus. Trans. from *Rivista di Artiglieria e Genio*, vol. 4, Dec, '14.]

#### —Permanent—Use of in European War

[Fortifications in the Present War. *Memorial de Ingenieros*, (Madrid), Sept, '15. 1000 words.]

A number of fortifications, such as Lille, Laon, La Fère and Reims were evacuated without any attempt at defense by the garri-

sons. This was not due to lack of confidence in their strength so much as a desire on the part of the higher commanders to augment their field forces.

At Namur the Germans emplaced two groups of heavy guns, in all 32, at less than five kilometers from the Belgian lines, and these guns concentrated their fire on a single sector. The defenders sought the shelter of their trenches and did not reply during the bombardments. The characteristics of the siege were: the silencing of the artillery of the defense; the destruction of the superstructure of the forts; the advance of the German infantry protected by their artillery; the penetration of the intervals; and the successive surrender of the forts. No assaults were necessary.

At Maubeuge the defense made all possible preparation: the forts were reinforced with concrete and armor; the intervals were strengthened and an excellent first line of defense prepared; wire entanglements were placed in abundance, and an armored train prepared to move along the gorge of the main line. The German infantry marched on Maubeuge on Aug 27, but was inactive until Sept 3, when the heavy artillery opened, the infantry remaining at three kilometers from the works. The place surrendered on the 8th, with 40,000 men. The characteristics of the siege were: the blockade, the bombardment by heavy artillery, advance of the infantry, attack on the intervals, the rupture of this line and the surrender.

The siege of Antwerp presented a peculiar feature, in that the strength of the garrison was triple that of the besiegers; the commandant of the place, with a signal disregard of the cardinal principles of defense, offered only a passive resistance. The forts were constructed on the principles of Brialmont, that is, by concentrating great strength in a small space. The defense followed the same principles, and the result was a catastrophe. The hope of Antwerp was that the German heavy artillery could not find favorable situations for concentrated fire, but the defense was so passive that the energetic labor of the German engineers in constructing bridges and approaches over the inundated areas near the forts was not even interfered with.

As a general rule, it may be stated that, if a besieging force is provided with heavy siege matériel such as that possessed by the Germans, and the defense has no equally powerful artillery, the garrison must make an active exterior defense to prevent favorable emplacement of the attacking artillery. Permanent fortifications in themselves have no inherent strategic value unless they are protected by an active mobile force. Works must be low on the ground and concealed, and the defensive preparations must be spread over a wide area.

[A Fortress of Sand. How Dvinsk is Defended. *Holland Gazette*, Nov 17, '15. Quoted.]

"A war correspondent writes from Russia to the *Vossische Zeitung*: We were informed yesterday that Dvinsk was the first modern

**FORTIFICATIONS—Continued**

fortress which had barred our way. A modern fortress is no longer built of concrete and armored plates, but of sand. From September 15 to October 26 we took the sand fortress of Dvinsk 15 times, and yet it is not in our possession. In those 15 storm attacks we captured 85 officers, 13,300 men, 35 machine guns, 3 bomb throwers, and 9 ammunition carts, and buried thousands of the enemy's soldiers, but still the monster fortress lies before us. It is enclosed in a semicircle west of the Dvina, with Dvinsk as its center, a radius of 22 kilometers and a circumference of some 69 kilometers. The area within this semicircle consists of thousands of undulations, hills, caves, marshes, valleys with brooks, woods, fields and swampy meadows. Every undulation, every hill, every slope bristles with well-prepared trenches. Not trenches dug by the troops in the middle of the struggle, but deep staircase passages, with broad roofs, made of three layers of turf covered by strong beams and supported by columns.

"Behind these continuous riflemen's caves, which are shrapnel and shellproof, trenches lead to shellproof rooms and so-called fox-holes, dug deep into the earth and with many angles, so that not a shell can reach them. As soon as a strong artillery fire is opened, the whole garrison creeps from the trenches to the protected places in the rear, whilst the scouts look out sharply for the infantry attack. It is wonderful that positions, defended in this manner and often situated at a great altitude, can be taken at all."

[Modern Fortifications. By Robert R. McCormick, Major 1st Cav., Ill. N. G. *Army & Navy Jour.*, Dec 11, '15. 860 words.]

In his volume, "With the Russian Army," Major McCormick devotes a chapter to the subject of modern fortifications, in which he reports the opinion of Russian officers who have had the greatest experience in building and the greatest success in defending fortifications. These officers hold that the Brialmont principle of separate forts is still correct, except that there must be an increase in the size of the forts and that the gun positions must be concealed with trees, bushes and grass.

The forts must have four or five times as many emplacements as guns, so that the position of a battery can be changed when it is discovered. In time of siege, the infantry supports burrow into a hill or hide in a concrete building covered with earth. The Belgian casemates were not heavy enough for the present artillery. A six-inch steel plate on top of the brick of Brialmont's fort would have kept out the German shells.

As a result of his studies, Major McCormick concludes that forts should be built at Albany, Buffalo, Pittsburgh, Atlanta, Vicksburg, and Houston. With such points in our hands, it would be possible to maneuver our less mobile and less effective troops against an invading army.

He also concludes that a thorough knowl-

edge of field fortification is essential for every officer. It is incumbent upon the United States to take to heart the lessons of the war, and to plan and test now all appliances and devices that will facilitate trench warfare.

[The Fortresses During the World-War. By S. Erik Bjuggren. *Tidskrift i Fortification*, Parts 1 and 2, '16. 4800 words.]

The fortresses considered are, 1. The fortresses in Belgium and Northern France quickly reduced and captured by the Germans; 2. The strong fortresses in Eastern France not attacked during the first eighteen months of the war; 3. The fortresses in East Prussia; 4. The Russian fortresses. 5. Przemyśl. A concise account follows of the operations on the western and eastern frontiers of the Central Powers, and the rôle which the fortresses played in these operations, with these conclusions: that the Verdun-Belfort front is yet unbroken; that Przemyśl was not taken (by the Russians) by attack, but was reduced by starvation, after a 4-5 months siege; that Ossovez for months stopped the German advance; that the Vistula-Nara-Bug-Niemen line at critical times, up to the great offensive in July, 1915, prevented the Germans from pursuing and destroying the defeated Russian armies and enabled these to reorganize themselves; that Königsberg and Thorn formed a base and support for the German operations; that the Belgian fortresses and those of northern France fell very quickly; and that the Russian fortresses also made but a feeble resistance after the Russian field armies had been defeated and been obliged to retire.

The speedy reduction of the Belgian fortresses has popularly been ascribed to the use by the Germans of the 30.5 and 42 cm. howitzers which quickly pulverized the outlying forts one after the other, but it must also be ascribed to the fact that the defenders made no vigorous *active* defense even when they had a larger mobile army, as at Antwerp, nor did they use their mobile artillery properly.

If a modern fortress shall be able to offer an effective resistance, it must have, among other things, a sufficiently powerful and numerous modern artillery with an ample supply of ammunition, and this must not all be confined to forts or redoubts where it can be easily located and destroyed by the enemy, but it must be such that it can be moved around to places where it can be used with the best effect. More use must be made of the offensive element of the defense.

Better protection must be provided for the garrison and supplies by means of secure casemates. A sufficient supply of aircraft, both for reconnaissance and for directing and observing the fire of the batteries, must also be provided.

See also

LIEGE, DEFENSE OF

**FORTRESS ARTILLERY**

See also

FORTIFICATIONS—PERMANENT

**FRANCE****—Aeronautics***See***AERONAUTICS—FRANCE****—Aeronautics—Dirigibles***See also***DIRIGIBLES—RIGID—FRANCE****—Army**

[Joffre's Remarks Concerning French Generals. *Jahrbücher, deutsche A. u. M.* Apr, '15. 1700 words.]

A recently published and evidently authentic interview with General Joffre discloses a certain amount of inconsistency between his official reports touching the mobilization and earlier operations of the French forces and his opinions as expressed informally and unofficially. The unofficial expression suggests disappointment at the lack of capacity displayed on various occasions by French generals exercising high command during the earlier periods of the war. This serves to confirm the opinion formed in Germany before the war, that the system of developing officers for the higher grades in the French army left something to be desired.

Joffre's remarks suggest that owing to influences over which he had no control it had been impracticable to remove from the army prior to the outbreak of war generals whose fitness to exercise high command he doubted. This indicates, first, that although General Joffre has been chief of the general staff for a number of years he had not succeeded in bringing about such an assignment of tasks, such a co-ordination of the various elements that go to make up an army, and such training as is necessary to efficiency, because a longer period of time is essential to the accomplishment of such results; and, second, that political influences operating upon the selection and dismissal of generals before the war had an important effect—influences that are especially potent in a democratic government in which the supreme command of the army is lodged with the incumbent of an elective office in which there are frequent changes.

[France. Army. *Information*, Aug, '16. Quoted.]

The government called to the colors, July 18, a part of the class of 1888, that is, men from 47 to 48 years of age, except those in munition factories and, for the present, farmers and farm laborers, busy with the harvest. Expert workers of various sorts of the class of 1888 had already been called some months before.

*See also***EUROPEAN WAR—FORCES ENGAGED****EUROPEAN WAR—SANITARY SERVICE****—Army—Artillery***See also***FIELD ARTILLERY—AMMUNITION—SUPPLY SERVICE—FRANCE****FIELD ARTILLERY—INSTRUCTION AND TRAINING—FRANCE****MACHINE GUNS—SERVICE REGULATIONS—FRANCE****—Army—Personnel**

[French Military and Naval Notes. From Our Paris Correspondent. *Army and Navy Jour.*, Feb 12, '16. 1000 words.]

There are as yet no generals of 24-25 years, yet promotions have been rapid and based on merit. General Pétain, who distinguished himself in Artois, was a colonel when the war broke out. He now commands an army of 200,000 men. The same is true of General Villaret, recently put in command of the army of Alsace.

General Foch, chief of the northern group of armies, is held to have had a prominent share in the victory of the Marne. He did his part without assistance from other forces. The French retreat from Serbia was made with great skill and scarcely any loss under great difficulties.

The *Queen Elisabeth*, *Pennsylvania*, and *Normandie* types of battleships are compared, with the conclusion that the *Pennsylvania* is probably superior in hitting power by three to two and the *Normandie* by less, but still superior to the *Queen Elisabeth*.

**—Army—Sanitary service**

[Editorial. *Le Caducée* (Paris), Sept 15, '15. 1000 words.]

On the subject of the creation of an Under Secretaryship of Health out of the 7th Section. It was expected that this would take the Army Medical Department from under the Intendance, but a non-medical man was chosen (M. Justin Godart), and he refuses to accept a medical adviser. The medical profession notes with regret the re-implantation of the Intendance in the Health Service under the title of *adjoint d'administration*.

[Military Medicine. By Medical Inspector Schneider (du cadre de Réserve). *Le Caducée* (Paris), Sept 15, '15. 1000 words.]

Concerns the enormous losses of French medical officers. Recalls the remark of Inspector-General Dujardin-Beaumetz when asked to obtain more consideration for medical officers, said, "Wait until the next war, and our losses will be so severe that the commander will be unable to refuse us anything." The losses have come, but not the expected reward. The mortality in the medical department follows immediately after the infantry. The blame is placed on those in authority for failure to issue the proper orders.

**—Army—Staff***See***STAFF**

(Article: "Composition of Headquarters," etc.)

**—History**

[Anglo-French Relations. By Maj.-Gen. T. F. Lloyd. *United Service Mag.* Continued through all issues of the year 1915. About 5000 words in each issue.]

(A study of Anglo-French relations from 1189 to 1453, hence of historical interest only.)

[Anglo-French Relations. By Maj. Gen. T.

**FRANCE—Continued**

F. Lloyd. *United Service Magazine*, Apr, '16. 4000 words.]

(Chapter XVIII of a continued historical treatise.)

See also

CRIMEAN WAR

GREAT BRITAIN—HISTORY

(Article: "Anglo-French Relations")

NAPOLEONIC WARS

NEY, MARSHAL

—**Military Topography of**

[French Topography Stops the Invader. By Charles Rabot. *Lectures pour Tous*, May 1, '16. 5000 words.]

From the North Sea to the Jura, the western front crosses three natural regions—Flanders, the Basin of Paris, and the Gap of Belfort. The Basin of Paris, in its scientific aspect, includes the entire region between the Ardennes, the Vosges, the northern rim of the central plateau, and Brittany. Hence are included the watersheds of the Seine and of the Somme, the lower valleys of the Norman coast streams, and the middle reach of the Loire. This region is below the level of the surrounding areas.

Forming a broad, shallow basin, the outcrops of the various geologic deposits form so many concentric rings around Paris. These deposits are characterized by the fact that they dip toward the capital. Thus in going west, we have first the Côtes de Meuse (jurassic), the Argonne (lower cretaceous), the Champagne cliffs (chalk), and, finally, the belt of tertiary hills rising around the immediate environment of Paris. Toward the north, however, the Paris basin is open; the only accident is found in Artois, a chalk swell separating Artois from Flanders. From Neuport to Dixmude the country is merely a network of canals, below high-water level; there is not the slightest relief, save the dikes of the railway, 2 meters above the surrounding level, and of the Yser, whose western bank dominates the eastern by the same difference. South of Dixmude, toward Yser, the ground rises a little, is less water-soaked, and becomes wooded. South of Armentières and the Valley of the Lys, comes the "black" country—a country in which the roads are bordered by houses that hide the intermediate fields. East of Lens, chalk convexities appear, hardly more than 200 m. in relief. In the race to the sea, the Germans in Oct, 1914, got a foothold in the eastern rim of these masses. Holding Notre Dame de Lorette (reference, 165 m.), they threatened the entire neighborhood, whence the allied offensive ending in the capture of Carency, Souchez, Ablain-Saint-Nazaire; hence the importance of Vimy Heights. If the Allies could get control of these chalk scarps the road would be opened to Lille and to Douai.

From Arras to Roye the lines cross the rim of the chalky plateau of Picardy, but on nearing the Oise, wooded hills appear; from Roye to east of Reims these become steep-sloped plateaus, with here and there isolated buttes. Such are the "mountain" of Reims,

of Laon, not two-thirds the height of the Eiffel Tower. Nevertheless, this mass constitutes a sort of natural fortress, and it played as considerable a part in the campaign of 1914 as it did in that of 1814. In neither could the French dislodge their adversary from the scarps north of the Aisne. This led in 1914 to the contests around Lassigny, and thence farther north to the sea. The Champagne country, east of Laon and Soissons, terminates the series of dry, chalky plains. The landscape now becomes one of hills and woods abundantly watered; in fact, their terrain is one of extreme difficulty in respect of military operations, and thus determined the violation of Belgium's neutrality. East of the Aisne rise the Argonne ramparts, whose highest points are not more than 100 meters above the valleys. But the country is a labyrinth of gullies and ravines, with bottoms of clay; the abundant rains convert it into a loblolly of mud during a great part of the year. As may be easily imagined, the struggle for the control of this region has been of the most desperate character. The Aire bounds (geographically) the Argonne region, but the terrain continues farther east to be even more accidented. Here belong the elevations on the west of Verdun, whose names have become household words during the past few months. Crossing the Meuse, we come upon a new rampart, the hills of the Meuse, a plateau from 6 to 12 km. wide, rising 120 to 150 meters above the Meuse on the west and the Woëvre plain on the east, a platform cut up into sections by cross-ravines. Farther south, the hills of the Meuse are breached, thus opening an easy road from the Woëvre to the Meuse. It was by the use of this breach that the Germans early in the war broke through and got Saint-Mihiel. The plain of Woëvre itself has been the scene of continuous struggle, of no effect except the combats at Fresnes, defending the eastern glacis of Verdun. On the east it is dominated by another line of hills, overhanging the Moselle. On one of these hills is found the famous wood of Le Prêtre. From the Moselle south to the Vosges, the entire space is occupied by hills and dales; here is found the Grand Couronné de Nancy, on which the German attempts on Nancy broke down. From these hills rise gradually the Vosges to terminate abruptly and perpendicularly on the borders of the Rhine plain. At the southern extremity of the Vosges begins the third natural region crowned by the French lines, the Gap of Belfort, guarded on the French side by the position of Belfort itself, and on the German by the fortress of Istein, on the right bank of the Rhine. For a long time this region was comparatively quiet, but since February has been the object of attention, seeming to indicate an intention on the part of the Germans to open a general offensive against Belfort.

[The Offensive in the West. The Scene of Battle. *Sphere*, July 8, '16. 500 words. Illustrated.]



The country along the Somme differs from the swamps and flats of Flanders and the slag heaps of Loos. It comprises wooded hills and little valleys along the Ancre and the Somme, with stretches of woodland, affording cover. The field of operations is more favorable than that of last year. It is an agricultural, not a mining district, and there is an absence of the points of support found in the mining centers. The villages are small, and there is a more open field for artillery fire. The Germans clung tenaciously to the woods, houses and small villages, from which it is difficult to clear the machine guns and trench mortars.

See also

GRESIVAUDAN VALLEY

—Military Vocabulary

See

VOCABULARY, MILITARY—FRANCE

—Munitions—Manufacturing Facilities

See

MUNITIONS—MANUFACTURING FACILITIES OF—FRANCE

—Navy

See also

EUROPEAN WAR—MILITARY LESSONS OF

THE

(Article: "Military and Naval Notes Abroad")

**FRONTAL ATTACK**

See

ATTACK—FRONTAL

**FUEL**

[Waste Newspapers as a Fuel for Military Camps. *Scientific American*, Jan 22, '16. 200 words. Illustrated.]

In Italy, discarded newspapers are collected, compressed into cylinders (apparently about 1½ inches in diameter), and cut into short pieces for fuel in the trenches. The resulting fuel is satisfactory and convenient.

[Paper as Fuel. By C. I. Wharton. *Scientific American*, Mar 18, '16. 200 words.]

The cylinders of paper are boiled in a solution of paraffin and naphtha for about 10 minutes. The soldiers do not like the fuel, as it burns with a sooty flame. It is used only in the trenches, and its manufacture is being discontinued.

—For Motor Transport

See

MOTOR TRANSPORT—FUEL FOR

**FUSE**

—For H. E. Shell

[Fuses for High Explosive Shells. By A. N., *The Military Historian and Economist*, Apr, '16. 2000 words.]

Artillerists were surprised to learn, just before the outbreak of the present war that the French had fixed their field artillery ammunition supply at 50 per cent each of shell and shrapnel. Previous to that time 25 per cent of shell was considered a large proportion. For many years artillery experts had applied themselves to the development of shrapnel and

great effort was made to perfect it mechanically, and much study was dedicated to the preparation of systems of field artillery fire with the shrapnel as its basic projectile.

The field shell, though not discarded, was generally regarded as a secondary projectile because of its low battering power and of its local effects on troops. The time shell was unsatisfactory because its burst could not be accurately controlled.

However, the results of the war have more than justified the decision of the French, for the present tendency is to increase still further the percentage of shell, perhaps to as much as 90 per cent, and since it is to be the principal projectile every effort is being made to improve it. The present French 75 mm. shell contains 29 ounces of high explosive while our 3-inch shell, weighing only 1 pound less, contains only 13 ounces. Thus the high explosive shock effect is apparently more desirable than the power to wound or kill by fragmentation.

However, for any given caliber, the character of the projectile and the high explosive charge are determinate and to introduce greater power a higher explosive must be developed. The only remaining way to improve the shell is to improve the control of its point of burst, and this means improving the fuse.

The mechanical action of the fuse is such that there will always be an interval between the impact and explosion. This interval is very short in the sensitive fuse and longer in the delay-action fuse. The deeper a shell penetrates before bursting the narrower the cone of destruction; the maximum effect being obtained when the burst is very near the surface of the ground. Against troops in the open the interval between impact and burst is usually too long.

The opposite of the above is desired however when the shell is to be used for demolitions, such as against trenches and field works, and in naval and coast warfare. Each function requires a special mechanism and the present problem is to place in the shell a fuse which may be converted at will from the sensitive to the delay-action.

**GASES, Asphyxiating**

See

ASPHYXIATING GASES

**GERMANY**

—Aeronautics

See

AERONAUTICS—MATERIEL—GERMANY

FOKKER MONOPLANE

DIRIGIBLES—GERMANY

—Army

[The German Army. By Captain A. W. Bjornstad, U. S. Army. *The Military Historian and Economist*, Apr, '16. 6500 words.]

The present day efficiency of the German army is the result of many years of labor, and is due partly to certain national or racial characteristics of the Germans, and very largely to the policies of the Emperor, his War Department and General Staff.

## GERMANY—Continued

Aside from good physique and intelligence of which Germany has perhaps a little more than her share, most of the effective points noticeable in the army may be attributed to one of the following: (1) Industry, (2) Individual Pride, (3) Hope of Reward and Fear of Retirement.

The German Army in time of peace is a school in which the natural industry of the officers and non-commissioned officers, combining patience with thoroughness, readily lends itself to the task in hand—that of turning out finished soldiers. The duty of peace time is to teach, and the permanent personnel of the army frankly consider themselves as high-class schoolmasters. They receive their new classes in the fall and in a definite time must achieve a definite result with the men entrusted to their care, and the efficiency of the instructors is judged by the excellence of the finished product. There is a universal misunderstanding as to the class of recruit with which the German officer has to deal. They are not the dull-witted clods that many people think them and, if statistics can be trusted, there is to-day less ignorance and illiteracy of the dense sort in modern Germany than in any other country. The Germans have the gift of teaching, the necessary perseverance and the ability to master details, and there can be no doubt but that the greatness of their army is largely due to the fact that its officers and non-commissioned officers are able teachers.

It would be impossible to say just how much of the German military efficiency is due to pride. German troops possess to a very great degree that *something* which moves them to unusual physical exertions and a careful performance of duty on all occasions. The Germans take great pride in merely belonging to the army, and the fact that every man, unless disqualified, must serve makes the soldier and the uniform universally respected. After 12 years a good civil service position is guaranteed to the non-commissioned officers. These positions are for life and the men who occupy them are very important in their communities. Therefore it is not surprising that the soldier is both proud of his service and pleased with the prospects it offers him.

For the officers the prospects of reward are even greater and the government offers certain peace time rewards which all are entitled to try for while they are still young. Every officer is of course anxious to make a success of his military career and the biggest step is an appointment to the General Staff. Such an appointment carries with it more rapid promotion. The appointments, being greatly desired, are difficult to achieve, but there are certain minor prizes which, although they do not carry with them better promotion, offer more varied and agreeable service. Such details are made almost entirely from among those officers who have tried for the General Staff and have failed. They comprise Corps, Division and Brigade Adjutants, War Department positions and a number of

other places. Such positions as our college, militia and recruiting details do not exist. With the exception of these officers appointed to the General Staff, promotion is by seniority up to and including lieutenant-generals.

In retirements Germany appears to reverse the policy followed in the United States and prefers to consider first exact justice to the government and then approximate justice to the individual.

There is no fixed retirement age and theoretically an officer remains as long as he is useful. Upon retirement he passes to the reserve and, if not too old, is still an asset in time of war.

The general scheme seems to be that an officer shall have all of the assistance he wants and needs, but that he shall be left to train his command in his own way—this will develop him. But when it becomes evident that he is no longer useful and effective another man is soon put in his place, and this fear of being retired and branded as useless serves to keep many an officer spurred on to further effort.

[His Majesty to his Officers. By Dr. Fried. Everling. *Jahrbücher, deutsche A. u. M.*, Apr, '15. 3800 words.]

The German Emperor, on various occasions during the quarter century following his accession, has sought, in the course of addresses to the officers of the Army, to impress upon them that perfect co-operation for the attainment and preservation of national ideals is possible only in a disciplined nation which trusts its leaders; and ruler and ruled, army and citizens, should stand together as one man; that the sovereign is the principal servant of the state, ready at all times to render an account of his stewardship; that his efforts to maintain peace with honor for the German people have been constant and zealous; that the German army is the German people under arms; that the sovereign and the army must look forward and must labor for the nation's future; and that it is the duty of every officer to develop and cultivate relations of trust, confidence and co-operation between himself and those under his command, to the end that each may give the most efficient expression to his best qualities not only as a soldier, but also as a citizen.

See also

EUROPEAN WAR—FORCES ENGAGED—GERMANY

## —Army—Artillery

[Note.—*Jour. Royal Artillery*, May-June, '16. Quoted.]

NOTE.—The information contained in the article entitled, "Notes on German Shells and Fuses," which appeared in the Mar, 1916, issue of the *Royal Artillery Journal*, is misleading, and is to be entirely disregarded.—Editor, *R. A. Journal*.

See also

FIELD ARTILLERY—MATERIEL—GERMANY

## —Army—Officers

See also

INFANTRY—INSTRUCTION AND TRAINING—  
OFFICERS—GERMANY

## —Army—Staff

[The Supreme Command in Germany. By Major von Schreibershofen. *La Guerra y su Preparación* (Madrid), July, '16. 4500 words.](This is a translation from the author's book *Das deutsche Heer*, and treats especially of the relations of the higher commanders and the General Staff, during the Franco-Prussian War.)

See also

STAFF

(Article: "Composition of Headquarters," etc.)

STRATEGY

[Article: "Cannæ"]

## —Army—Uniforms

See

UNIFORMS—GERMANY

## —Coast Defense

[The German Coast Defenses. By Hector C. Bywater. *United Service Magazine*, July, '16. 5600 words.]

The North Sea coast of the German Empire is the most heavily fortified stretch of coast in the world. Nature has done much to render it inaccessible to the enemy, and at those few points where no natural obstacles exist, military science has surpassed itself in erecting fortifications. It is impossible to give any account of the measures the Germans have taken to strengthen their coasts since the outbreak of the war, but a description of the work accomplished before that event may be attempted.

Between 1860 and 1885 it is safe to say that considerably more funds were spent on forts than on ships, and although the complicated budget methods favored in Berlin render it impossible to arrive at exact figures, it is certain that within recent times the expenditure on fixed defenses has continued to represent a very substantial percentage of the total outlay on national armaments. The Germans have always ascribed the safety of their coast towns during the war of 1870-71 to the strong fortifications which even at that date were much in evidence. It is quite true that the French squadron which cruised in the Baltic made no attack on German territory, and the immunity of such places as Kiel and Danzig was, no doubt, due to the formidable batteries which guarded the approach to those places. One of the main reasons for the reluctance of the Reichstag to deal generously with the navy estimates prior to the Tirpitz era was the heavy expense involved by the modernization and extension of coast fortifications. The deputies, however, were ready enough to vote money for vessels of the coast service type, i. e., small unseaworthy ironclads, armored gunboats, and torpedo craft, because they thought such vessels might serve as substitutes for the more expensive fortifications which the military authorities would surely demand later on. Thus, when the Kaiser

Wilhelm Canal was begun in 1887, it was proposed to protect it by building powerful batteries at each end, namely, Brunsbüttel and Holtenu, the cost of which would have been very high. But before any decision was reached, William the Second had ascended the throne, and one of his first acts was to veto the proposal. Instead of forts which might not be able to save the canal locks from a long-range bombardment, he suggested the creation of a special naval squadron for the defense of the canal. Eight small ironclads were accordingly laid down between 1888 and 1892, constituting the *Siegfried* class. They were of 4100 tons displacement, and mounted three 9.4-inch guns and ten small quick-firers. Under such peculiar circumstances did the nucleus of the German High Sea Fleet come into existence. Of the twenty-four places officially classed as fortified bases, stations, or depots of the imperial marine in home waters, nine are on the North Sea coast and thirteen in the Baltic, while the remaining two, Neumünster, in Holstein, and Dietrichsdorf, near Kiel, are situated inland, the first being an important wireless station, and the second an ammunition depot.

The German North Sea coastline stretches from the Ems to the Danish frontier, and is about 220 miles in extent. In order of importance, the naval stations are as follows: Wilhelmshaven, Cuxhaven, Heligoland, Emden and Sylt. The great war harbor of Wilhelmshaven, nominally ranking after Kiel, but first in actual importance, is of comparatively recent date. The Jade Bay on which it is situated passed into Prussian hands in 1853 by treaty with the Grand Duchess of Oldenburg, and two years later the work of founding a first-class naval base was begun. It proved an infinitely longer and more arduous task than had been anticipated. The breakwaters and sea walls were repeatedly swept away by the strong tides peculiar to this region, and for the first two years next to no progress was made. It was not until June, 1869, or fourteen years after the commencement of the work, that the port and dockyard, henceforth to be known as Wilhelmshaven, were declared complete. No less a sum than three millions sterling had been spent in that period, exclusive of the fortifications. The yard had been planned on a generous scale, and subsequent extensions have made it one of the largest and best equipped naval establishments in the world. It covers an area almost four times as great as that of the sister yard at Kiel. Between 1908 and 1912 various improvements were carried out at the cost of one and a half millions. They included the construction of a new entrance to the yard and of additional building-slips, workshops, and general plant. At the same time, the fortifications were brought up to date and extended. In 1914, the yard contained four building-slips, seven dry and six floating docks, and power-driven plant, with an aggregate horse-power of 7500 units. The staff numbered 11,000, of whom 36 were officers. Wilhelmshaven is the headquarters of the

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North Sea station, and has both a governor and a commandant. It is, or was, the home base for the first and third battle squadrons, the cruiser squadron, four destroyer flotillas, and the first submarine division.

The Jade is far from being an ideal situation for a first-class base. The fairway, 14 miles in length, has to be dredged continuously to keep it from silting up. On this work two dredgers, each with a capacity of 5000 cubic meters per hour, are employed without intermission. Furthermore, the abnormal rise and fall of the tide made it essential to devise an elaborate system of locks, through which warships of heavy draught could enter and leave the port at all times. One advantage of this is that it renders the dockyard and the ships stationed there absolutely safe from enemy torpedo craft or from submarines. On the other hand, a good deal of time is taken up in operating the sluices when ships are passing in and out, and for a whole squadron to pass through the locks would be a matter of many hours. The port is defended by batteries along the western shore of the Jade, so placed as to sweep the very narrow fairway. The heavy guns, said to be of 9.4-inch and 11-inch caliber, are in armored cupolas, the position of which is invisible from the sea. There is also a shore torpedo station and a mine depot. The approach to the Jade is commanded by the Wangeroog, the easternmost island of the East Frisian group, which lies twenty miles north of the base. Apparently the strategical importance of this place was not always recognized, for it was only in 1910 or 1911 that steps were taken to fortify it. Very powerful guns are now mounted there, and the garrison in peace numbered five companies of the second Matrosen-Artillerie division, a figure which conveys some hint of the strength of the defenses, for the garrison maintained at Heligoland numbered only four companies. The conversion of the Wangeroog into a heavily armed fortress not only rendered the prospect of a *coup de main* against Wilhelmshaven very remote, but practically removed all danger of the dockyard being exposed to long-range bombardment. Long before hostile ships could approach within range of the port they would come under the fire of the Wangeroog batteries, where, if rumor is to be credited, guns and howitzers up to 12-inch caliber are in position. Germany's principal base on the North Sea is thus well secured against a naval attack.

Cuxhaven is the seat of administration for the North Sea coast defenses and the pivot of the whole system. Here are the headquarters of the mine service and the naval airship branch. As soon as the new harbor works were completed, Cuxhaven took on the character of a secondary naval base, and ships were often sent here to relieve the congestion at Wilhelmshaven. The deep-sea harbor, finished in 1901, has a depth at low water of 26½ feet, and the depot of the Hamburg-Amerika Line affords excellent coaling and

repairing facilities. In 1905 the naval authorities purchased a large tract of foreshore at Groden, two miles southeast of the town, where fortifications, barracks, and ammunition magazines were established. In the same year the mine service was made a distinct branch of the navy, and the first company of specialist officers and men was formed. This step was due to the experience of the Russo-Japanese War, which was held to have demonstrated the immense potentiality of naval mines when scientifically employed. The defenses include the sea forts of Neuwerk, Kugelbake, and Grimmerhorn, and the batteries at Neues Fort, Dose, and Groden. Some extremely heavy metal is mounted here. On the northern shore there are lighter batteries at Neufeld and Brunsbüttel, to deal with any hostile ships which might have escaped the main defenses and were aiming for the canal locks at Brunsbüttel. This formidable accumulation of coast artillery, together with the mine fields which ought to prove very effective in the narrow and tortuous Elbe estuary, constitute a barrier against which no fleet could dash itself without suffering cruel loss. The excellence of the Cuxhaven defenses is largely the result of representations made by the powerful commercial interests of Hamburg. But Hamburg apart, the immense importance of closing the estuary to hostile ships became evident as soon as the Kaiser Wilhelm Canal was completed. Rightly or wrongly, the canal is judged by the Germans to be the dominant factor in their naval strategy, and if anything occurred to deprive them of its use the result would be disastrous.

Heligoland to-day, as the apex of the "wet triangle," is said to be the most formidable naval fortress in existence, not excepting Gibraltar. It bristles with guns of the most powerful type, so well protected as to be practically safe from any bombardment. The ravages of the sea, which caused such havoc in the days of the British occupation, have been entirely checked by the German engineers, who have, indeed, turned the tables on the devouring element and wrested a considerable tract of land from its maw. This successful reclamation work has trebled the original expanse of foreshore, and provided space for the laying out of a small dockyard, with berths for twelve vessels of moderate dimensions, and the usual workshops, storehouse, and magazines. The dockyard is flanked by two breakwaters, one 650, and the other 430 yards in length, curving inwards at the extremities and enclosing a spacious and absolutely protected harbor. Thus, while the dockyard itself is intended mainly for torpedo craft and submarines, other vessels of all except the maximum dimensions are able to use the artificial harbor, the narrow entrance to which can easily be made secure against torpedo attack.

From trustworthy evidence, it is clear that Heligoland is being used in the war as an advanced base for the submarines, destroyers, and light cruisers engaged in the North Sea operations. It is also an important station

for the North Sea air patrol. One revolving double shed, to house two Zeppelins of the largest type, was completed shortly after hostilities began, and seaplane hangars were erected some years ago. It may be added that the harbor works just described involved an expenditure of  $1\frac{1}{2}$  millions sterling, but this sum does not include the outlay on the special measures against sea erosion, which at a moderate estimate cost another  $2\frac{1}{2}$  millions. A further item of expenditure is represented by the new fortifications, which were completed in 1912-13. All communication between the various batteries is underground. The magazines are deep down in the rock, and could not possibly be hit by shells. Heligoland, in fine, is about the least promising objective imaginable for a bombardment, though its big airship shed, harbor buildings, and dockyard, with the vessels inside, ought to prove a tempting target to bombing seaplanes. The value of the island to Germany is, no doubt very great, if not as great as was hoped before the war.

Geestemunde and Lehe are both situated at the mouth of the Weser, the first-named to the south, and Lehe to the north of Bremerhaven. They bear the same defensive relation to the port of Bremen as Cuxhaven bears to Hamburg. Bremerhaven, the depot of the North German Lloyd, is also defended by the works at Geestemunde and Lehe, between which it lies. There are great docks here to accommodate ocean liners, or, if necessary, warships of large dimensions, and there are also a well-equipped coaling plant and repair shops. It is, therefore, quite possible that during the war Bremerhaven is being used as a base by the German fleet. Geestemunde is a town of 25,000 inhabitants, on the left bank of the Geeste River, where it joins the Weser. The old fortifications date from the sixties of last century, but new works were built ten years ago. In 1905 a mine depot was established here, from which all the submarine defenses of the Weser are controlled. Lehe, further to the north, has two strong forts.

It is only within the last four years that Emden has come into prominence as a naval base. The  $2\frac{1}{2}$ -mile channel leading from the Ems up to the port was widened and deepened sufficiently to allow the passage of vessels drawing more than thirty feet. Adjoining the harbor itself an immense basin was cut, capable of holding a whole fleet of big steamers. Everything, in fact, pointed to the Emden as the selected base for overseas military operation on the most formidable scale. Its position is well adapted to such a purpose. Screened from observation by the Frisian Islands, several of which have been strongly fortified, a fleet of transports could assemble here in absolute secrecy. With many lines of railway converging on the port from inland military depots a large army could be concentrated at short notice, and its embarkation rapidly accomplished. That it would serve as one of the principal bases for an army of invasion, should the Germans decide upon such an adventure, is no less certain.

The fortification of Borkum, which was a topic of much discussion in the English press a few years ago, began in 1909. Situated at the mouth of the Ems, and less than twelve miles from the coast, this island commands the approach to the river, and has been fortified on a scale commensurate with its strategic importance. For the defense of Borkum, the military are responsible. The defense works, which are well concealed among the dunes, are known to be extremely powerful. Besides the heaviest guns of position there are mobile batteries of quick-firers, operating along a railway which completely encircles the island.

The northernmost bastion of Germany's line of North Sea defense is Sylt. Until 1912 no permanent defenses existed here. So far as is known, the defenses are almost entirely mobile, consisting of heavy and light field ordnance. In addition to these bases and fortified places, there are several other minor points along the North Sea coast which, although unfortified in peace time, have certainly been put into a state of defense now. From the Ems to the Danish frontier there is not a mile of accessible seashore without its formidable defenses, which would have to be reduced before any landing could be attempted.

Kiel is not only the premier dockyard and naval arsenal, but the principal stronghold in the Baltic. The bay is six miles long, and the entrance but narrow, so that the problem of defense against attack from the sea is not a difficult one. Further in the bay widens, until between the canal locks at Holtenau on the west side and Heikendorf on the other shore it is 5500 yards broad. Clustered at the entrance is a series of forts and redoubts, some old, but others new. The outlying works are Fort Herwarth and Fort Falkenstein, and further up the bay are the battery of Friedrichsort, Forts Stosch, Jagersberg, Korugen, and Moltenort. In all, there are, or were a few years ago, 90 guns mounted in these works, comprising 78 9.4-inch pieces and two batteries of 6-inch quick-firers. The landward approach to the harbor is dominated by Forts Herwarth, Robsdorf, and Holtenau. Robsdorf lies on the east side of the bay, near the bathing beach at Laboe, and is connected with Forts Stosch and Korugen by a sunken road. It is claimed that the turret guns at Robsdorf have a range of 33,000 yards. At Friedrichsort arrangements exist to close the harbor entrance by a boom, and at the same place there is a large mine depot. Danzig, the second fortress in order of importance, has lost much of its earlier value since German naval power gravitated towards the west. At least half the German U-boats now in service have been built at the yard on the Mottlau. The sea defenses of Danzig are at Neufahrwassee, the deep-water port of the city, and distant from it about five miles. They are controlled by the army, but there are some very powerful guns of large caliber in the forts. Another well-defended point is Swinemünde, at the mouth of the Oder, and the seagate of Stettin. Here, too, the military look after the batteries,

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though the minefields are under naval supervision. Sonderburg, Flensburg, and Eckernförde are naval stations of secondary importance, but all are fortified.

It may be observed that the Baltic coast is not nearly so well defended as the shorter and more intricate North Sea front. There are long stretches of shore without permanent defenses of any sort, but the railway communications are so excellent that within a few hours troops could be rushed to a threatened point in overwhelming strength. Germany, in a word has brought her system of coast defenses to a pitch of perfection which has never been attempted, much less equalled, elsewhere.

**—Colonies and Colonial Policy**

[The Colonial Ambitions of Germany. By Jacques de Dampierre. *Revue des Deux Mondes*. Jan 1, '16. 9500 words.]

Colonies, from the point of view of Bismarck, were a sort of political concession to national ambitions, disapproved of by him. Since his time, these ambitions have grown to the point that the war of 1914 could be presented to the German people as a necessary emancipation from Franco-English colonial monopoly. The comparative poverty of Germany in colonies was represented to the people as a great international injustice.

Even after a year of war, public opinion clings to some of these dreams, and perhaps the more so because Germany sees escaping from her the European supremacy to which she aspired.

The present war has permitted us to recognize not only in the acts of subalterns, but even in the declarations and decisions of German statesmen, the same conceptions which used to make us smile and shrug our shoulders when those who knew the conditions beyond the Rhine pointed them out to us. It is well, then, to know what Germany's ambitions are.

National unity having been realized by three successful wars, it was inevitable that her increased activity should ultimately be directed to the outside. But the great task of internal reorganization was sufficient to occupy the with the result that there was a considerable generation following the victories of 1871.

At first commercial development did not keep pace with the increase in population emigration. From 1881-1890 some 1,300,000 persons emigrated, but the total fell to 520,000 in the next decade. From 1900, the number of annual emigrations went on diminishing and in 1912, there were only 18,545. German industry had developed to the point of being able to furnish work for all her workers and even to admit foreign labor.

If, then, the German Empire possessed the two principal elements which generally justify a colonial policy, to wit, an excessive birth rate and the need of commercial outlets, we must not lose sight of the fact that these two conditions were not realized for the same generation of men, in such a manner as

to justify, strictly speaking, one of those irresistible impulses of public opinion which are sometimes imposed on the wisest governments. This is a capital point in the evolution of contemporary Germany, for pan-Germanist authors have not failed to confuse the issue on this point, a confusion favorable, of course, to their theories, but certainly contrary to the facts.

This fully justifies, moreover, the hesitation of the German statesmen to launch their country prematurely into a policy of colonial adventures for which she did not seem to them sufficiently prepared. We are not discussing here whether the German of today possesses more or less than the Frenchman or the Englishman the qualities of good colonizer. The important thing to note is that neither the mass of German public opinion nor the government itself was really preoccupied with these questions, at the time when the Empire was sending out hundreds of thousands of emigrants. This fact might have made Germany desirous of possessing a few colonies, one would think. But, far from considering them, like the pan-Germanists of to-day, that the flag of the Empire should float wherever German subjects live, the men of Bismarck's time and Bismarck himself thought that the true means of furnishing industrial Germany with the outside clientèle necessary to the sale of her products, was to disseminate throughout the world, and under any flag whatever, German subjects, agents or consumers of German merchandise.

The means followed in this policy seem to have stimulated remarkably the economic development of the country. It is not at all certain that Germany would have found in new colonies the rapid increase in political and commercial influence which she has achieved by the diffusion of so many thousands of her people among all the organized societies of the modern world. The foundation of colonies would have entailed long immobilization of the national capital, which Germany needed at home, right after 1870. Was not financial development of the young societies, in which the German emigrants worked, assured by non-German capital and, a thing that is at least piquant, sometimes even by French capital?

Bismarck was then not entirely wrong in considering that the grouping of German emigrants in foreign countries was worth more to Germany than the best of colonies. This opinion was not long in being opposed by even those who claim that they draw the principles of their sinister megalomania from the examples and words of that great man.

With these noble declarations of principles was mingled a growing jealousy for the bold initiative which was building for France a colonial empire at least the equivalent of the one she had lost a century earlier.

To satisfy the new imperialism in Germany, Bismarck, in 1885, caused to be recognized by the conference of Berlin the sovereignty of Germany over the Hinterland of some African coasts, more or less thoroughly explored by

German subjects. Germany then assured herself of quite a respectable share in the division of Africa and that without striking a blow, almost without any meritorious effort beyond well-conducted diplomatic negotiations. France had subscribed to all these arrangements, and England seemed to view with some satisfaction German colonial power offsetting somewhat the growth of a French colonial empire.

At the same time, the German navy was acquiring islands in the Pacific. Germany seemed in a fair way to make for herself peacefully a place beside the great colonizing nations.

The colonial acquisitions of Bismarck coincides well with that period when the German birth-rate could permit the Empire to turn floods of emigrants into new lands: but neither the political nor the business world had then in Germany either the resources or the experience necessary to properly utilize these energies in colonies which it would have been necessary to supply with all sorts of tools and material. To accomplish this hard task, not only were men of colonial experience lacking but also capital sufficiently powerful and disinterested to be able to wait a long time for remuneration. Private finances were far from being as considerable then as 40 years of prodigious activity and unlimited credit have recently made them. As for the public finances, it was a long time before the Reichstag felt in a position to use them to make of the imperial colonies not a costly place of exile for functionaries but a real investment for the future.

It does not seem that the Germans of Bismarck's time possessed the moral energy or the physical resistance of the French colonists of Richelieu's time: the latter without the advantage of being preceded by public works, nevertheless constituted very vigorous societies. At any rate, the peopling of the German colonies failed in a manner the more singular when it is compared with the results of German emigration in other countries or with the growing prosperity of the English and French colonies, their contemporaries and neighbors.

Striking official figures, from the Almanach de Gotha itself, demonstrate the incapacity of the Germans during 30 years of colonial empire. Over a total area of more than 3,000,000 square kilometers, with more than 12½ million natives, there was, according to the last statistics, a European population of only 28,859 inhabitants. On the other hand, the French colony of Tunis has 50,000 French; Indo-China, in spite of its tropical climate, 22,000; Madagascar, more than 13,000; Morocco, 26,085 civilians and 22,000 other whites.

It may be asked, then, what are the reasons that push the pan-Germanists, after such painful experiments, to claim new domains for the increase of their over-sea empire. Undoubtedly, this "hunger for territory" rests on purely psychological bases: the old jealousy of France, which is one of the essential forms of German patriotism and the old

Prussian tradition of territorial extension, which is, after all, only the peasant instinct for possession of the soil. But there were economic interests more serious. In proportion as Germany's emigration diminished in response to the startling development of her industry, she became an exporting nation, no longer of men but of manufactures. For the latter were needed outlets, more and more numerous, and privileged outlets perhaps. But, at the same time, the United States of America with her 12 million Germans, far from remaining a market for Germany, had developed her own industry to the point of becoming the most terrible of competitors, even in societies which, like South America, had a considerable number of German colonists, more consumers than producers.

So, at last, the ambitions of the pan-Germanists and the interests of the business world coincided. For the former, it was a question of prestige not to allow possible competitors to develop under a foreign flag. The example of the United States, "grave of Germanism," was too conclusive for the German patriots to be anything but frightened at a repetition, even on a small scale. Business circles could see the financial advantage in the exploitation of a vast colonial empire. They were very favorable to the large conception of an all-German Central Africa, with all the seaports, railroads, cities, etc., entailed by such a project. The idea of the pan-Germanists was based on a desire to see Germany have all the territory possible; that of the world of affairs tended rather to the constitution of a vast ensemble of exploitable colonies, in which the German flag was to float solely because trade follows its own flag preferably.

All of these conceptions might have easily been organized into an adroit and methodical policy by using capitalistic power and political intimidation. Of course, it was out of the question to acquire all at once countries already colonized by other European nations or those enjoying an independence universally respected. But from the fact that France and England had been far-seeing enough to take the initiative in Africa and acquire the countries most suited to Europeans and from the fact that the old Spanish empire had been for a long time broken up into independent states, it did not necessarily follow that Germany must forever renounce her dream of colonial empire. Among the autonomous nations, there were many so feeble financially and in a military way; among the colonizing countries there were some for whom colonies appeared such a heavy obligation that Germany might have hoped to find many good opportunities on the surface of the globe. The Carolines had been the first; a few years later, the trouble known as the Boxer uprising, in China, permitted the Empire to "lease" about Kiao-Chao a rich and populous territory which assured it a solid economic and maritime base in the Far East. But, in the thoughts of the pan-Germanists, these were

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only tentative maneuvers preparatory to more grandiose acquisitions.

The promoters of a "Greater Germany" have not failed to set forth in all its phases, for the past fifteen years, the possibility of making up for lost time and of carving in the world "her place in the sun." The publications reflect two kinds of imperialism: the political, eager for more territory, and the economic, seeking especially exploitable domains. To the former it seemed that they had some rights, or at least that possibilities of intervention might arise, from the fact that German colonists were established in such great numbers in South America; then the development of German interests in Turkey seemed of a nature to presage an acquirement of the parts of that old empire formerly rich and now almost abandoned. To the latter, the Dutch insular colonies and the Belgian colony of the Congo appeared "out of proportion to the resources of those two little countries" (Holland and Belgium), which would be glad, no doubt, to get rid of them, to Germany's profit.

It must be admitted that the example of the Jameson raid and the Anglo-Boer war which ensued had made a strong impression on the brutally realistic spirit of certain Prussian circles, too much disposed to praise such methods and, at the same time, perfectly incapable of causing them to be forgotten, as the English have done, by the liberality of their government. An opportunity of intervention, in the name of threatened German interests, seemed to be offered, too, in the anarchistic situation of certain South African republics, and this policy was urged by pan-Germanist authors, from 1900 to 1905 notably.

The Russo-Japanese war modified somewhat this conception, it would seem. Not only was the equilibrium of the world disturbed, but this war demonstrated once more the formidable military difficulties involved, for even the best of armies, in a campaign some thousands of kilometers from its base. Spain had never been able to conquer her colonies in revolt; the Mexican war had been fatal to France; and even England, who formerly had been unable to recover her American colonies, had succeeded in dominating the Transvaal only by using all the forces of the most powerful navy in the world. So the nearer and surer opportunities seemingly offered by the weakening of Russia and a certain relaxation in the spirit and military institutions of France, attracted attention. It seemed that there was hardly any European power capable of opposing the wishes of Germany "if she should speak loud and clear." For example, the way might be prepared for the realization of that great African empire which would unite the German possessions of West and East. Of course, that was a vast program, but there was "something to be done," especially as France seemed willing to act in Morocco and as that might, at need, be advanced as a pretext for beginning the conversation.

It is known how this singular conversation was carried on by Germany from 1905 to 1911! Tangier, Algeciras, Casablanca, Agadir, are fresh in the memory, and there is no need to go over here that story which is that of Germany's colonial disappointment. But the positive results required by Germany, from the colonial point of view, were far from being as negligible as the pan-Germanists have claimed. General von Bernhardt undoubtedly considered as a bait the clause of the open door in Morocco, and Frymann, in his celebrated pamphlet "If I Were Emperor," did not hesitate to state that Morocco, on account of its mineral and agricultural wealth and its advantages as a dwelling place, should have been the main objective of German colonial policy. It was, however, more just to think, with the economist Paul Rohrbach, that German policy had had reason to consider Morocco only as a means of pressure on the French government, to obtain elsewhere appreciable advantages. "The real end," says he in a recent pamphlet, "the end that we were pursuing in the acquisition of the new Kamerun could hardly be exposed before the war. You recall that two singular protuberances or horns extended from our new domains as far as the Belgian Congo. It is by them that we could reach the navigable part of the Congo and take contact with the Belgian Congo. France possessed an option on the old Congo Free State, which became later a Belgian colony. In the Morocco-Congo treaty, she renounced this right, in a manner if not explicit, at least practically efficacious."

A few months before the war, a German technical expedition, accompanied by several high Portuguese officials, had left for the south of Angola (a Portuguese colony) in order to study a projected railroad line connecting the systems of Angola with those of German Southeast Africa.

Thus, by the admission of a leading exponent of the German colonial idea, the Franco-German treaty of 1911 opened a beautiful perspective to German trade in Central Africa. Is there any need to say that, on the route of these pacific conquests, they would hardly have found any Franco-English cannon or bayonets?

Hence, the violent crisis which unchained the world war cannot be explained by the discontent of the business world in Germany. Far from blocking systematically pan-Germanist ambitions, France had taken the trouble to find them a field of endeavor. Trusting in her own pacific intentions and satisfied by arrangements that enabled her to complete in Morocco her work of civilization in North Africa, the French government was justifiably alarmed at the profound resentment aroused in Germany by the ardent renaissance of Slavism, victorious in the Balkans. After a certain theatrical trip that Kaiser Wilhelm II had made to the Holy Land, the imperial policy did not dissimulate its intentions in the Ottoman Empire. The idea of a Germano-Turkish alliance, looking towards a sort of economic protectorate over Turkey to Ger-



many's profit, was gradually gaining ground in Berlin. Anatolia, cradle of the oldest civilizations of the ancient world, answered well these desiderata, it seems, and the Bagdad railroad, built by German industry, was to constitute for Germanism a new means of peaceful and lucrative expansion.

In the month of November, 1912, Paris commenced a diplomatic conversation with Berlin relative to the satisfaction of the legitimate desires of the two powers in the Orient. Finally, on Feb 15, 1914, an agreement was signed at Berlin defining the zones of economic influence to which the powers interested limited themselves in the Asiatic domains of the Ottoman Empire. On this point, it may be said that, on the eve of war, the understanding of the great European powers was perfect and that it assured peacefully to Germany the most complete development that her most insistent "colonials" might dream of.

By what singular aberration did the German government deem itself obliged to compromise, in the most formidable and, consequently, the most hazardous of wars, the tangible results thus assured to it? That is one of those historical enigmas that ancient wisdom explained by the celebrated maxim: "Whom Jupiter wishes to destroy, he first makes mad." It seems difficult, indeed, not to see, in what the anonymous author of "J'accuse" calls "the preparation of the crime," a real ambush prepared for the peace of Europe, to the profit, not of the German people, but of a sort of coterie of officials, petty lords and officers, intoxicated by pan-Germanist sophisms. This coterie had long played with and profited by these doctrines, but they finished by being themselves the dupes of them, pending the time when they shall be judged responsible and shall be called upon to expiate their fault.

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The colonial ambitions of Germany had then, in 1911, attained those of their objects which would favor most directly the development of the Empire and that, not only without striking a blow, but even in perfect accord with France, England and Russia. These great powers, the only ones which could present obstacles to Germany's expansion in the world, had taken the opposite attitude by recognizing, in Asiatic Turkey, a sphere of economic interest. From Anatolia to Mesopotamia, there was assured not only a vast exploitable domain, but also the possibility of creating, from Hamburg to the Persian Gulf, a direct commercial line of communication of great importance. In Africa, the Powers did not oppose an understanding with Belgium and Portugal, to extend across their possessions a system of railways or waterways, which would not have failed to gradually put all the commerce of Central Africa into the hands of the greatest, richest and most industrial of the colonial states of those regions. Germany found there, besides, all facilities necessary for developing her national industry by means of ore, rubber, wood, and other

staples, the exportation of which from the African coast to her ports she would have soon monopolized. And, thus, little by little, would have been realized the pan-Germanist dream of a Central Africa entirely German, if not in administration, at least in commerce.

The pan-Germanist program was set forth in 1911 in a book entitled "Gross-Deutschland," by a writer using the pseudonym of Tannenberg. In it beautiful perspectives were presented to the eyes of the enthusiasts: the republics of South America, dominated by the German residents would become a vast German "dominium"; the German African Empire would absorb, besides the Portuguese and Belgian colonies, Morocco and the French Soudan, leaving us only Algeria and abandoning Tunis to the Italian; Dutch Insulinde would be annexed to the German Empire, like Holland itself and Belgium; finally, from the Kiaochau base, an energetic policy would extend the protectorate of Germany over all China, properly speaking, leaving Manchuria to the Japanese. The painful surprises to German opinion from the English, Japanese and Italian intervention on the side of France, not less than the results of the Battle of the Marne, the Russian resistance and a few other miscalculations, have undoubtedly enlightened somewhat, if not the pan-Germanists, at least many of the great "territory-eaters" of yesterday. But the German colonials have not for so little abandoned their projects of conquest, and, a curious thing, what they claim today is hardly more considerable than they might almost have obtained yesterday with a little more gentleness, tact and skill. If they mourn the lost opportunity of an expansion of political influence in South America, which would create difficulties with the United States, they have not abandoned the idea of taking a preponderant part in the economic development of China, under the pretext that Japan has not the means to exploit that vast empire. It goes without saying, for them, that a protectorate over the Ottoman Empire has been acquired, since they have succeeded in galvanizing all its forces for an impious war against France! As for Africa and the rest of their colonies, which have been captured by the English and French, they reason in a way that should be remembered: "Even if we should obtain, in all the theatres of war, only results partially sufficient, it would seem to me probable that we should acquire territory in Africa, *for we have, at all events, possession of important guarantees in the West*, and it will not even be necessary to lose completely these guarantees (I do not need to name them); it ought to be sufficient to retire a step here and there, in order to bring our adversaries to give us, only for that, the necessary compensation in Africa."

It may be that Mr. Paul Rohrbach and his readers have still cruel disillusionments in store for them! The idea of offering Belgium her liberty in exchange for the Congo and France the evacuation of her territory against colonial concessions more or less

**GERMANY—Continued**

considerable, has already been the basis of an exchange of views between well-intentioned neutrals or, as Rohrbach says, "straws to show which way the wind blows." But France, who formerly consented, though with reluctance, to make, in the cause of universal peace, the sacrifice of a part of that French Congo, hallowed by the blood of her sons and the heroism of her explorers, France has too much confidence in the justice of her cause and the valor of her army to lend an ear for a moment to propositions which would appear to her like a sacrilegious blackmail. In 1914 she was ready to debate with Germany on their respective interests, on a footing of courteous equality and benevolent dignity. She cannot bargain now till after the victory and she is grateful to the government of the republic for having on several occasions known how to answer, in historic words, those who thought they could doubt it. The "crime" of the world war is one of those that can be punished only by a humiliation before the world. The German eagle will have to be satisfied, henceforth, with the capon's flight, and Prince von Bülow, in the new edition which he is undoubtedly preparing of his celebrated book on "German Policy" will do well to add a few unedited commentaries to the exposé of the skillful acts that the later chancellors of the Empire have believed themselves bound to add to the traditions of Prince Bismarck.

**—Finance**

[German War Finance. By M. Chase Going. *Jour. Political Econ.*, June, '16. 13,000 words. Tables and diagrams.]

(For a thoro and authoritative discussion of the financial preparations of Germany, and of her financial operations during the war, the reader is referred to the original article. Only salient points are touched in this review.—Ed.)

Financial plans for the prosecution of a war had received the same careful attention in Germany as had military plans. The Reichsbank, thru its power to issue notes, was to provide funds required for mobilization purposes. Financial writers believed that the war should be carried on with irredeemable paper money. Provision was to be made for loan institutions to relieve the Reichsbank of such business. Loans were to be relied upon to meet actual war expenses after mobilization.

The Spandau "war treasure" actually existed and amounted to 120 million marks in gold coin. By the sale of Imperial Treasury notes this amount had been increased to a total of 205 million marks, and further by a special tax yielding 300 million marks in 1914.

(The financial situation immediately preceding and following the outbreak of war is here traced. The Reichsbank ceased to redeem its notes in gold on Aug 1, inviting attention to the fact that its notes were legal tender and as good as gold. The various measures taken by the Reichstag to permit the issue of large amounts of paper money and maintain public

confidence in such money are stated. The Darlehnskassen (loan bureaus) and their operations are defined and described.) Thus, with thoro German efficiency, provision has been made for granting credit to worthy persons of all classes, and so avoiding a general moratorium. Nevertheless, the German measures resulted in a practical moratorium.

(The credit operations of the government are then described, and the campaign to procure gold from the people. The methods of floating the loans authorized by the Reichstag are also described, and tables analyzing these loans are given.)

German's war expenditure is at the rate of 14 billion marks a year, and a present debt of 40 billion marks gives an annual interest charge of 2 billion marks, as compared with a total revenue (1913-1914) of 3,193,000,000 marks.

The German plan was built upon the supposition of a short, brilliant, war and a large indemnity. A long war was not considered possible. A year was considered the limit. So the financial plan undoubtedly was founded upon this supposition.

(The depreciation of the mark is then traced.)

**—Food and Commodity Prices and Supply**

*See also*

EUROPEAN WAR—FOOD AND COMMODITY PRICES AND SUPPLY—GERMANY

**—History**

[Formal Occupation of the Newly Acquired Province of Posen in 1815. By Major Carl von Thümen. *Jahrbücher, deutsche A. u. M.*, Apr, '15. 4600 words.]

The Royal Prussian proclamation in accordance with which Prussia took formal possession of the Province of Posen was issued on May 15, 1815. The instructions addressed to Lieutenant General August von Thümen, commanding general of the occupying forces, enjoined upon him the maintenance of the strictest discipline in his command and the most considerate treatment of the population of the province. Under the agreement concluded at the Congress of Vienna the evacuation of the province by the Russian military forces was to have been completed on May 30, 1815; but the Russian authorities delayed the operation so that the evacuation was not completed until the end of the year. Though this delay on the part of the Russians caused some friction, the actual establishment of government under Prussian authority did not await the final removal of all of the Russian troops. Early in August of 1815 deputies representing all districts of the province appeared before a royal commission in the capital city of Posen and there took the oath of allegiance to the King of Prussia. The acceptance of the new government by the people of the province was influenced by the fact that the principal civil representative of the Prussian Crown was selected from a prominent provincial family and local officials were not displaced, thus leaving the government largely in the hands of the men to whom

the people had been accustomed to look for leadership.

—Military Conditions in

See

PRESS CENSORSHIP—GERMANY

—Military Policy of

[The German Way. Editorial. *Independent*, Mar 6, '16. 800 words.]

German strategy is *German*. Although criticised by Allied experts as unsound, German methods are used, and as a rule they win. By sticking to the offensive, the initiative has been held generally on all fronts. The Allies are forced to meet their moves and their feints. The threat against Saloniki has diverted 350,000 French and British troops to that point. Reports of a Turkish and German concentration in Palestine have diverted, say, 500,000 British troops to Egypt. The British force on the Tigris was attacked and had to be supported.

Having thus got the French and British troops well scattered, the Germans began their offensive at various points along the western front, culminating in the attack on Verdun. Yet the British and French generals could not have done otherwise. Their difficulty was one imposed on the defensive rôle.

It was argued that the Germans were getting so short of men that their best plan was to stick to the defensive in their trenches. Reports have it that the German losses at Verdun are frightful. Exaggerations of losses at Liège, for example, make it possible that the German losses at Verdun are not so great. Still the assault on Verdun appears a desperate venture.

[The Book of General Bernhardt—Germany in the Next War. By Victoriano Cesare. *Revista Militar* (Portugal), Feb, '16. 6300 words.]

This book was published in 1912, and six editions had been issued in 1913. The last edition, Spanish, has just been published. The book may be considered as evidence of German intentions and that her plans of conquest had been made. It deals plainly with the imperialistic doctrines of Germany, but does not attempt to defend them. It lucidly exposes the ideas and ideals of the German nation. The book contains much of the philosophy of the country and presents much matter over which governments with vast colonial dominions and military men may ponder.

Bernhardt considers war first; and to him war represents the necessity for the conservation and progress of human society. War is presented as the touchstone of the political, physical, and intellectual valor of a nation. Without war the inferior races degenerate and constitute an obstacle to the advancement of humanity, and the result is universal decadence. War is not only a biological necessity, it is indispensable in the selection of the races, and is one of the greatest factors in the development of civilization and culture.

Germany, with her 67 millions, could not

permit England, with only 45 millions of inhabitants, to dominate the trade of the world and continue in the supremacy of the seas.

The book deals at length with the colonial and political policies of Germany and other countries of Europe. Germany's military policy was founded on the principle that the combative force of the army depends upon its instruction, armament, and upon the human element in the organization of troops.

As the future of Germany is held to be on the sea, the necessity for a naval force equal or superior to that of England is fully recognized, and the means of bringing about this equality is considered.

The war so far has brought out that Bernhardt was right in his predictions in many particulars, his strongest contention being that the war was (is) inevitable.

[From Clausewitz to Hindenburg. The Development of Strategic and Tactical Doctrines in the Prussian Army, Preparation for the War of 1914-1916. By Emile Laloy. *Mercure de France*, June 16, '16. 5000 words.]

For two years Europe, desirous of peace only, has been suffering from a war engineered by an Emperor avid of glory and of conquests. Whatever other reasons may have influenced him, one of the most powerful assuredly was his faith in the superiority of the strategic and tactical methods of his Staff. These methods aimed at surrounding and capturing entire armies, and afterwards to penetrate without hindrance to the farthest boundaries of the states attacked.

After the fall of the First Empire, a number of writers, chief among them Jomini, undertook to set forth the rules followed by great warriors. Most of these men wrote in French. But in 1832 the publication of Clausewitz's "War" gave the German officers a great advantage over the French. As a rule, a writer on war limits himself to an investigation of the most recent campaigns. Jomini and Clausewitz both took the same subjects, but Jomini's work is, so to say, a preliminary sketch, while that of Clausewitz is definitive, particularly in the domain of tactics. Jomini limited himself to the Napoleonic strategy, but Clausewitz went as deeply into tactical combinations as into strategic. Thanks therefore to this officer, German officers worked in an intellectual atmosphere superior to that of France, and it was in this atmosphere that Von Moltke was bred.

When this great captain was in 1857 appointed Chief of the General Staff, France was, in a military sense, more conspicuous than ever. But the Crimean war, 1854-56, relieved Prussia of the fear that France would form an alliance with Russia and Austria, and Von Moltke began to elaborate his plans against Prussia's southern and western neighbors. It was the tactical and not the strategic aspect of the problem that caused him any concern: what was the correct formation of infantry for attack, line or column?

The French successes of 1859 at first caused

**GERMANY—Continued**

some doubt in Von Moltke's mind, but he quickly recovered. His confidence in the breech-loading rifle, as compared with the muzzle-loader, used by all European infantries except the Prussian, led him to accept in full the principle of Clausewitz that the defensive is stronger than the offensive, i. e., a skillful general must know how to take up positions so offensive that the enemy is forced to attack them. As early as 1866 he recognized truths, still a sealed book to French theorists in 1914.

After 1870-71, Von Moltke remained at the head of the German General Staff, occupied in the instruction of his officers, in the direction of staff journeys, and in commenting on tactical works. The results of his labors after 1871 have been in part published. They are summed up in the affirmation of the superiority of the tactical defensive coupled with the strategical offensive. But he scarcely advanced beyond this point: the consequences of the great increase in the front of opposing armies, and of the improvement of weapons seem not to have been foreseen by him; in particular, trench warfare, unaccompanied by any possibility of turning movement seems not to have occurred to him. He resigned in 1888, and was succeeded by Von Waldersee, who, in turn, gave way in 1891 to Von Schlieffen. The reasons for this substitution became plain in 1909 to those who had eyes to see. Von Schlieffen remained at the head of the Staff until 1905, when, because of his age, he resigned. In 1909 he published in the *Deutsche Revue* an article on modern war, in which he described a present-day conflict as he understood the matter. The picture drawn by him was exactly represented by the present war in its earlier stages. The Emperor marked his appreciation of the idea of his former chief of staff by reading this article himself to his generals on New Year's Day, and by emphatically declaring his approval of its conclusions. In France the article was undervalued. To Schlieffen the campaign of 1866 and 1870-71 had proved that the superiority of fire-tactics over shock increased with the improvement of firearms; in consequence, he felt himself justified in declaring (1908) that a given front could be defended by one-third of the number felt to be necessary in 1870. Hence frontal attacks were losing day by day their chance of success, and, in any case, were so costly that any advantage procured by them could scarcely be called a victory. Therefore, victory may be obtained only by a turning movement; but whereas Von Moltke contemplated this movement only as a means to crush an adverse wing, Von Schlieffen regarded it as a means of bagging the entire hostile army. Troops attacking, without firing, troops able to use their weapons, to Von Schlieffen was equivalent to the target's attacking the marksman. A general must take in rear of the enemy positions that will force the enemy to attack in order to keep his line of supply open. The enemy must therefore be turned at any cost, and this calls for the greatest extension of front possible and an

advance by all available roads. In order that such operations may succeed, a gap must be found in the enemy line or it must be turned. In both cases as few troops as possible must be held on the front, in order to have the greatest number for the gap or the turn. Hence the need of temporary fortifications on the front held. Von Schlieffen's plan, therefore, contemplated lines such as protect the front of the belligerents in the present war; and it is probably to him that are due the lines of trenches against which broke the allied offensive after the battle of the Marne. But this, again, is merely an amplification of an idea of Von Moltke's.

In his *Cannae*, published (1909) in the *Vierteljahrshfte für Truppenführung*, Von Schlieffen demonstrates the decisive superiority of all maneuvers, tactical or strategic, that have for their objective the turning or encircling of the enemy. The part of this investigation devoted to Napoleon marks its author as a transcendent genius, and shows him to be the most luminous of all the commentators on the great Emperor. German though he is, he has no mercy for the incapacity of the Crown Prince (later the Emperor Frederic), and of Prince Frederic Charles.

These articles of Schlieffen made a great sensation. The French, looking upon Napoleon as infallible in matters of war, in undertaking to refute them attempted the impossible, as the experience of 1914 was to prove. The generals who opened the war in this year were Von Schlieffen's pupils; there is no doubt that his philosophy was a great factor in the temerity with which William II entered upon it. In the west, fortunately, the doctrine we have been studying has suffered a check. It was completely successful at Tannenberg, and late in Feb, 1915, in the operations against the army of Baron Sievers. The best commentary on the value of this doctrine is the fact that the allied generals have themselves adopted it and are trying to apply its principles.

**See also**

EUROPEAN WAR—GENERAL NOTES ON OPERATION, BY THEATERS—WESTERN THEATER  
(Article: "The Invasion of Belgium")  
GERMANY—NAVAL POLICY OF

**—Military Records and Decorations**

[Notes on the War. Editorial. *Artill. Monatshefte*, July-Aug, '15. 500 words.]

Lt.-Gen. von Gallwitz, formerly Inspector-General of Field Artillery, is the first Field Artillery officer to be decorated with the order *Pour le Mérite*. At the outbreak of the war he commanded the Guard Reserve Corps. In July, 1915, he commanded one of the field armies on the Russian front under von Hindenburg. He forced the crossing of the Narw River, and in a ten days' battle decisively defeated the Russians, capturing several fortresses and 41,000 prisoners, approximately the number captured at Königgrätz.

**—Military Vocabulary****See**

VOCABULARY, MILITARY—GERMANY

## —Navy

[Recent German Naval Construction. By M. K. Barnett. *Scientific American*, Dec 6, '15. 1200 words. Illust.]

German naval construction since the outbreak of war has been shrouded in mystery. Four dreadnoughts of 25,575 tons, 21.5 knots, armed with ten 12-inch guns each, were nearing completion at the outbreak of war. These have undoubtedly been completed.

Three battle cruisers, were in an advanced stage of construction. They were 26,600 ton ships of 27 knots, armed with eight 12-inch guns each. These are claimed to have been rearmed with 15-inch guns, a claim believed to be impossible of accomplishment at the advanced stage of construction. They were probably completed in June, 1915. Probably two more dreadnoughts, laid down in 1913 have been completed, and possibly also the "Salamis," building for the Greek government. Thus the total addition of capital ships has probably been four dreadnoughts and three battle cruisers, with two additional dreadnoughts to be completed in 1916.

No one outside German naval circles knows what has been done in the construction of submarines. Considering that Germany has devoted enormous energy to this type, it is possible that sixty submarines have been added to the already large number that Germany had on hand at the beginning of the war.

(The types are described, and there is no special novelty in the design.)

[German Shipping. *The Army and Navy Gazette*, Dec 4, '15. 200 words.]

Sweeping from the oceans the German mercantile fleet is one of the most valuable achievements of the navy. A few details of this accomplishment were supplied by Sir Owen Phillips at the annual meeting of the London Maritime Investment Company on Nov 11. Sir Owen said that at the outbreak of the war the German mercantile marine consisted of 5,459,296 tons, as against 19,256,766 tons owned by Great Britain. Of the German tonnage, 230,000 tons have been captured by the British navy; 38,000 tons by our Allies; 117,000 tons have been sunk; 397,000 interned in British ports; and the remainder, about 4,677,000 tons, with the exception of an insignificant number of small steamers in the Baltic, has been rusting for more than a year in German or neutral ports. The large amount in neutral ports is due to the chain of wireless stations all over the world, which Germany's foresight had provided. Just before hostilities began, a message was transmitted warning merchant ships to make for safe ports. That one message was the means of saving from capture more than 80 per cent of the German mercantile marine.

## —Naval Policy of

[The Task of the German Navy. The Relation between the War and the Economic Situation according to General von Blume. By M. B. D. *Riv. Mil. Italiana*, July, '16. 2800 words.]

A short time before the beginning of the

present war General von Blume, the leading German military writer, published a study under the title: "To what extent have the conditions of success in war been modified since 1871?" He concluded that the Germans should conduct war offensively, with the greatest energy and violence, in order to subdue the enemy in the shortest possible time. It will be of interest to examine his views on this subject, as well as on the question of the task of the German navy and the close relation between the war and the economic condition of the country.

*The task of the navy*

General von Blume recognizes the necessity of keeping open the sea routes of Germany's foreign trade, at least to neutral flags, and emphasizes the importance of the foreign trade as an element in Germany's power of resistance. He says that the German fleet must be so strong that its destruction will involve losses by the enemy that will make him too weak to maintain the blockade. His conclusion is that Germany must be prepared to carry on a naval war and at the same time prevent a blockade of her coast. She therefore has a greater need than England of the two-power standard. General von Blume admits that in war the superiority in number of combatants will be against Germany, and says that this disparity must be overcome by superior intellectual and moral force.

It is to be noted that the Germans have not followed the teachings of von Blume to the extent of sacrificing their fleet for the sake of inflicting a corresponding loss on the enemy.

*The relation between the war and the economic situation*

General von Blume estimates that a year of war would cost Germany \$1,500,000,000. In this he was gravely in error. He says that for material supplies, such as animals and equipment of all kinds, the only safe plan is to rely solely on what can be produced within the country. The three principal economic resources of the country are agriculture, industry, and commerce. Agriculture furnishes food, industry and commerce furnishes money. Agriculture will be disturbed least by war. Great disturbance will occur in those industries that depend on foreign supplies of materials in a raw or partly manufactured state. Commerce will be paralyzed and credit will suffer.

General von Blume asks what will be the effect of an economic crisis on a war. The insolvency of the proprietors and the lack of work for the operatives will produce a sentiment hostile to the continuance of the war. This sentiment may become strong enough to break down the government.

It is remarkable that a discussion of such a grave economic question should have been allowed to be published in Germany. One plausible explanation is the profound belief of the general staff in the invincibility of the German army.

**GERMANY—Continued****—Navy**

See also

GERMANY—NAVAL POLICY OF  
SUBMARINES—USE OF IN EUROPEAN WAR**GREAT BRITAIN****—Aeronautics**

See

AERONAUTICS—GREAT BRITAIN  
AERONAUTICS—MATERIEL—GREAT BRITAIN  
AERONAUTICS—PROTECTION AGAINST AERO-  
NAUTIC ATTACK—GREAT BRITAIN  
DIRIGIBLES—GREAT BRITAIN**—Ammunition**

See also

EUROPEAN WAR—AMMUNITION—SUPPLY—  
GREAT BRITAIN**—Army**

[European War. Great Britain. Information, Jan, '16. Quoted.]

The House of Commons, Dec 22, passed the bill increasing the strength of the British army to 4,000,000 men. The army bill was passed in committee of the whole, after a fourteen hours' sitting. The newly authorized army, H. J. Tennant, Parliamentary Sec. of the War Office, stated, was the largest army ever raised in England. He said that under modern war conditions it was necessary to have at home in reserve 1.8 men for every soldier in the field. This estimate was based on the monthly wastage of 15 per cent.

[Available Recruits. *The Army and Navy Gazette*, Jan 8, '16. 400 words.]

Based upon some calculations of Mr. H. Morgan-Brown in the *Westminster Gazette*, relative to the number of men of military age—17 to 40—in the United Kingdom, it is estimated that 16.28% of the total population or 7,365,000 men are available for the army. These figures refer to the census of 1911.

The same percentage of the estimated population in 1915 would raise the number to 7,611,000. Of these it is estimated that, in round numbers, four million are unmarried and three and one-half million married. Assuming that about 20% of these men are physically unfit for service there remains a gross total of about 6,000,000 potential soldiers.

Deducting those necessary for the industries, it is believed that 4,000,000 is the maximum number of men England can provide.

[War Notes. By Captain H. M. Johnstone, R. E. *United Service Magazine*, Feb, '16. 4000 words. One sketch map.]

In counting up Lord Derby's figures, everybody has watched eagerly to see whether the unattested bachelors would prove to be on proper scrutiny a "negligible number." When the figure worked out at 650,000, it became clear at once that Mr. Asquith must either break his word to the married attestors or bring in compulsion, even though necessary deductions should reduce the 650,000 to half that figure. On the 5th of Jan, the terms of the bill were made public. The 650,

000 unmarried men who did not attest are not the kind to give in without a struggle, and tens of thousands of them will discover mothers or sisters or younger brothers dependent on them. Accordingly it is to be hoped that sharp penalties are available for cases of fraudulent claims of exemption. In fact, the appellant should in all cases be put on his oath, so that false statement would be legal perjury. Furthermore, what is to be said of the astonishing clause about the conscientious objector, which will probably prove to be a wide loophole, and is absolutely pernicious to the system? An additional point of discussion is, why should Ireland be exempt?

[The Army and the Nation. By Brigadier General F. G. Stone, p.s.c. (A lecture delivered at the Royal Artillery Institution, 19th Nov, 1914.) *Jour. Royal Artillery*, Jan, '16. 5000 words.]

At the present time when the army is engaged in an unprecedented campaign, it is opportune to recall other occasions when it played the rôle of a moral force of supreme influence without striking a blow.

These periods were:

- I. The Civil War, 1642-47.
- II. The Revolution of 1688.
- III. The Irish Crisis of March, 1914.

An attempt will be made to describe the part played by the army in the first and second, but for obvious reasons the third cannot be discussed.

**The Civil Wars of the Reign of Charles I.**

The first Civil War, 1642-47, may be said to have inaugurated the system of a standing army in England. In the first year of the war, the Parliamentary Army was costing a million a year, which sum was raised with difficulty. But the army thus created was inadequate to subdue the Royalist forces, and in May, 1643, it was proposed in Parliament to request assistance from Scotland. The negotiations with Scotland for help finally were carried through late in 1643. The main obstacle to agreement was religious. The English were for a civil league, the Scottish for a religious covenant. The English Parliament needed a Scottish army in its war against the King, and finally accepted the covenant, in effect making Presbyterianism the established religion of England, Scotland and Ireland.

On February 5, 1644, Parliament ordered that every Englishman over 18 years of age should take the Covenant. Opposition soon developed. Cromwell signed the Covenant in February, 1644, when he was appointed Lieutenant General, but forebore to impose it on the army. In September, 1647, he persuaded Parliament to pass a resolution instructing its committee to endeavor to treat with the Scottish regarding religious toleration.

The first Civil War ended in January, 1647, and Parliament was face to face with the army it had created, but for which it now had only limited use.

In 1647 a scheme for the reduction of the army and for payment of arrears of pay due

the men was adopted. The soldiers demanded in addition an indemnity and the maintenance of their regimental organizations under the command of their tried and trusted leaders, Cromwell and Fairfax.

It soon became evident that Parliament, pledged as it was to the Covenant, was intent only upon breaking up the army and ridding itself of a large force of independents opposed to the Covenant. Two prominent Presbyterians were placed in command, so an organization was started to carry a petition to Westminster. Parliament, now alarmed, sent Cromwell and other military leaders to treat with the men, promising payment of their demands; but in the meantime it took measures to evade its obligations to the army and to crush the independents. To enable it to offer armed resistance to the demands of the army, orders were issued for the reorganization of the City Militia from which all independents were excluded. All soldiers of the parliamentary army who refused to go to Ireland, were to be discharged. Cromwell endeavored, without permanent success, to persuade parliament to offer concessions.

Mutinies broke out at various places, and confronted with this state of military anarchy, Cromwell and Fairfax, believing that, by its attitude in giving the religious freedom of the English people into the hands of the Covenanters, Parliament no longer represented the people, joined the army at New-castle. Thither the king was carried, forestalling the plan of carrying him to Scotland.

Now followed a period of negotiation during which plans for religious toleration for all classes, for the reform of parliament and the administration of the country, were presented by the army. These were not accepted, and the relations between king and parliament soon had relapsed to their state previous to the first civil war.

In the summer of 1648 the second Civil War broke out. On May 3rd, the Scottish Parliament demanded that all Englishmen take the Covenant, that heresy be suppressed, that the independent army be disbanded, and that the king be brought to London for purposes of negotiation. This action of the Scottish brought about a settlement between parliament and the army under which government by king, lords, and commons would be retained and toleration under a Presbyterian dispensation be secured. This agreement Cromwell had some difficulty in persuading the army to accept.

On August 27th the second Civil War ended with the capture of Colchester, the last royalist stronghold.

Negotiations between parliament and king were protracted until October 27, when they were broken off as it was evident neither party was willing to concede anything to the other, and parliament would not bring matters to a decision. Ireton now drew up the "Remonstrance of the Army" among other things demanding a speedy trial of the king. This was considerably modified to include the

original proposals of Cromwell by a council of officers.

The subsequent establishment of a military dictatorship forced upon Cromwell by the circumstances of the times, does not concern the subject of this article.

### *The Revolution of 1688.*

James II, not content with trying to govern as an absolute monarch, overriding the constitution, early in his reign took measures to restore the influence and prestige of the Roman Catholic Church. He caused bishops to be brought to trial for refusing to read the Act of Indulgence in the churches before it had received the sanction of Parliament, and he undermined the discipline and morale of the army by attempting to displace the Protestant English troops by drafts recruited in Ireland.

At this juncture, a combination of powerful Protestant peers on June 20, 1688, despatched an invitation to William of Orange to intervene in arms for the restoration of English liberty and the protection of the Protestant religion. Lord Churchill at this time was the most prominent English general and possessed great influence with the army which James counted upon as a guarantee of the security of his throne. On August 4 Churchill cast his lot with William of Orange, but in order to insure the success of William's enterprise, was forced to play a double rôle and remain in command of the troops of King James until after the landing of William at Torbay, on November 5.

To resist William's advance James intended to concentrate at Salisbury. On November 17, the king accompanied by Churchill and a numerous staff left Windsor for Salisbury, which was reached on the 19th. On the night of the 21st Churchill, accompanied by several officers and about 20 troopers, went over to William.

Churchill's defection settled the revolution without any blood being spilled; officers and their men all over the country offered allegiance to William, and there was left no officer of prominence in the service of the king. King James decided to retire and fled to France. Thus was accomplished without bloodshed the most momentous revolution in England.

[Commissions and How to Get Them. (Editorial.) *The Army & Navy Gazette*, Feb 26, '16. 250 words.]

We receive constant inquiries from our soldier readers as to how to obtain commissions in the New Army. We often have to flatly contradict ourselves in our replies, because of frequent changes disclosed in what is called "an important departure" made by the War Office in the method last announced. Another of these "important departures" has just occurred. In future, Boards of Officers will visit periodically all the different centers and interview enlisted applicants for commissions who are recommended by their commanding officers as being in every way suitable. No

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applications for commissions will in future be sent to the War Office, but to Command Headquarters where the interviews will be held. One wonders what particular quality, expression of countenance, mode of wearing the hair, or manner of dress will appeal to the Board of Officers.

[The English Forces. Letters to all the French, No. 8. By Louis Cazamian, end of Feb, 1916. Accompanying *L'Illustration*. Translation in full.]

(Quoted as giving the French estimate of the British Forces.—ED.)

There was great joy in France, when we found out, at the beginning of the war, that England would be with us. England was the valiant enemy, now to become the sure and loyal friend; she represented robust force, cold will, tenacity. She was going to fight for the right, for violated Belgium, for invaded France; and also for her own liberty, for her existence.

She brought to the common cause first her support on the sea (and we know that the English fleet was the foremost one of the world), then her military aid; but the English army was not very large. Would it be sufficient? The war was going to be terrible, we felt that. England had not prepared for it at all. As much as we, more perhaps, she trusted in peace.

Moreover, protected by the mobile rampart of her fleet, she believed herself to be sheltered from invasion; and, as for the quarrels of the continent, she had not foreseen that she would be obliged to intervene in them by force of arms.

England was not acquainted with obligatory service. Her army was recruited solely by voluntary enlistments. An average of 100,000 men were enrolled each year; some in the regular regiments (which remind us a little of our old professional troops), each with its name, its tradition; others in the territorial army, a sort of militia, created not so very long ago. The territorials underwent periodical instruction only, but the regulars were excellent soldiers, good shots, well disciplined, joyous companions withal. They were in garrison in the mother country and used to go and fight for the Empire in Africa or India. But how many were there of them? Barely 120,000. It was from them that England had to draw in order to come to our aid. Besides, she could not strip her coasts too much, a German invasion being among the possibilities. Therefore, the English expeditionary force sent to the continent comprised, at the beginning, only four divisions, 80,000 men.

Fortunately, it was quickly reinforced. The English colonies had their special corps, recruited, as in Canada, in the country itself, or formed, as in India, of mixed brigades, native and British, commanded by English officers; some colonial divisions landed in Flanders. The territorials as soon as they

were better drilled, rapidly became solid troops. But already had begun an admirable piece of work, which we see being developed each day. On her own soil, England had begun to raise, to organize, an absolutely new army.

**I. Kitchener's Army.**

Let us take account of what this effort means: creating an army complete in all its parts. To assemble the men, to lodge them, to clothe them; to prepare for them rifles, cannon, ammunition; to instruct them and train them; to form the line officers who will command them, the staff officers who will direct them; to find non-commissioned officers in sufficient numbers; to put on a good footing the services of the line of communications, the supply, the trains, the hospitals, the ambulances; and all that in gigantic proportions, in a few months, that is an enterprise of which the history of wars furnishes few examples. The name of one man will be attached to it: a great organizer, Lord Kitchener.

The hundreds and hundreds of thousands of Englishmen who have volunteered will continue to be a just source of pride for their country. In Aug, 1915, England had 3,000,000 men under arms; one sees at a glance what the prodigious work of one year has been. The figure has gone up still more since; recruits have flocked as on the first days, to answer the call of their king; and *Parliament has brought the strength of the army up to four million*.

It is not enough to satisfy the growing needs of the war, it has been necessary to make a supreme sacrifice; to give up the principle of voluntary enlistments. This caused a dramatic conflict to break out between old powerful instincts and unexpected necessities. The Englishman has a vigorous, jealous feeling about personal liberty; all his traditions made him distrustful as to the military obligation; for him, it belongs to the conscience of each one to decide whether he should or not offer his services to his country. Against a mental attitude so different from ours, the most clear-seeing minds have been struggling unremittingly for a year; and now the mass of the English people is converted to the right of the country to call all her children. This moral evolution, one of the most remarkable that any people has ever undergone, has just been crystallized by the legal formula which completes it. Bachelors are no longer free in their choice, and imperious duty has a close grip on all citizens. Parliament has voted a law, the title of which sounds strangely to English ears: a law on *military service*.

The effective aid that England gives us is to-day ten times greater than at the beginning. She has a million soldiers in France; in the total, on the various fronts, she has—without counting the colonials—a *million and a quarter* combatants; she will have more when it is necessary.

For, if she has already paid the blood-tax—her losses, in Jan, 1916, reached the figure of 550,000 men—she still has the flower of her youth and strength. Her territory is a vast



camp of instruction; soldiers everywhere, the reserves are there, all ready, or finishing their training; the wear and tear of the war, on fronts near or distant, is at once repaired, will be until the last day. When Germany no longer has enough men, England will still be drawing on her great resources. And these "new armies," supple, gay, hardened already to fatigue and peril, representative of a people of athletes, are admirable.

Let us not forget, in this rapid review, the contribution of the Colonial Empire. Everyone knows the exploits of the Canadians at Ypres, of the Australians at the Dardanelles. And, there also, the figures, modest at first, are still going up; Canada, alone, has given 250,000 soldiers; she promises 500,000.

Voluntary enlistment, obligatory service, these terms here are equivalent; a slight shade of meaning separates them. Every Englishman to-day does his duty, for he is no longer ignorant of what it is; he knows that his country is struggling for its life. *With a population slightly greater than ours, England will have, in the near future, armies nearly equal; they would be equal and even greater, if large numbers were not used in the English navy, and many in the war factories.*

## II. War Industry.

When the allied countries came to understand that they would beat Germany by dint of artillery fire, they made an inventory of their resources in machines, as in men. Our looks turned towards English soil, where iron and coal lie dormant, towards those cities where high chimneys rise by thousands; but all the industry was occupied in the ordinary labors of peace. A transformation was imperative; in spite of enormous difficulties, it is to-day accomplished.

There were required rifles, machine-guns, field guns, heavy cannon; there were needed ammunition, cartridges, shells, small and large, hand-grenades, aeroplane bombs, aerial torpedoes; and to charge all these engines, explosives. Under the impulsion of Mr. Lloyd-George, Minister of Munitions, England was divided into districts; each of them has organized the manufacture for which it possessed the necessary equipment, or could acquire it. Machines were lacking; some were ordered from America. Many manufacturers had zeal, but few means; they grouped themselves so as to deliver a complete product. Certain tasks exacted a concentration of labor; national factories were created. *Thirty-three emerged from the ground in a few months. Where formerly stretched meadow and moor, rise to-day immense workshops, working feverishly, day and night. Union rules, labor customs, used to hinder sometimes discipline or intensity of effort; union rules were suspended as the profits of the contractors were limited. Central authority was extended to all the cells of the great hive. The number of establishments thus controlled was, on Jan 31, 1916, 2720; and, in this figure, vast enterprises, similar to our Creusot, are counted as a simple unit. The workers who make munitions are one and three-quarter millions in England;*

among them there are many women, many aged volunteers, who are working with equal zeal. Here again, let us not forget the effort of the Colonial Empire. *In Canada, 320 factories are making munitions; they employ 100,000 qualified workmen. Let us not forget, either, other war industries; for instance, the looms of Great Britain; since Aug, 1914, the allied governments have bought from them 22,000,000 meters of uniform cloth.*

In the Loos attack, last Sept, the English artillery was able to do the same good work as ours in Champagne. To-day, says a minister, Mr. Bonar Law, the Germans receive from the English two shells for every one that they fire. . . . The machine is constructed; it has not yet reached its full capacity; but one may measure what it will yield. It is not alone the English armies, but the allied armies as well, that profit by it and will profit by it more and more. Next spring, Lord Kitchener has said, Russia will have found arms for 6,000,000 new soldiers; and the factories of England will have furnished as much of this immense matériel as those of Russia.

## III. The Fleet.

In spite of the unforeseen developments of the army and the war factories, the fleet has remained the preferred arm of a people of sailors. A terrible arm and one which was ready at the beginning. Mysterious, hidden in the mists of the north, it acts by the radiation of its secret strength. Rare, so far, have been naval encounters; and the morning of the great battle has not yet dawned. But the German men-of-war do not dare to leave port; one after another, the German colonies are conquered, and the wealth, the life even of Germany, her maritime commerce, is languishing. It is like a strangling cord. The English blockade, slowly, perhaps, but inflexibly, assures victory.

An active force, the English navy is being renewed, adapted and increased; it has as much future as efficient present and glorious past. Germany believed, she even announced, that her submarines were going to destroy the English fleet; weeks passed, and the submarines did not return to port; with an invisible parry, the English fleet foiled the attack, dominated it. Is it a matter of stopping German commerce in the Baltic? England handles better than anybody else the submarine arm. Must the Turkish forts be bombarded without fear of torpedoes? She creates a squadron of monitors on a new model.

The advantage of the English fleet over its rival is much greater to-day than at the beginning of the war. In Aug, 1914, it had 20 battleships of the Dreadnought type, 41 of less recent construction; 122 cruisers, 220 torpedo-boat-destroyers; 106 torpedo-boats, 74 submarines. It has gained since—not to speak of the rest—14 new Dreadnoughts; *it has been increased by a tonnage equal to that of the German fleet.*

## IV. Economic Power.

A country of industry and commerce, England has been rich for a long time. Her wealth is profound, massive; it is not a varnish that

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cracks, the fortune of a parvenu. One feels it indeed, on seeing the welcome given by the money-changer in any country to the heavy English gold-piece. On these immense reserves, at least equal to ours, feeds the energy of war; as long as they last, the effort of the army, the effort of the fleet, can last. Better situated than France, free from invasion, England has suffered less in her economic activity; and the gradual levy of her men respects the vital industries that nourish the social body. English finances, still more than ours, constitute the common treasure of the Allies; they have borne the crushing burden of an improvised army; they lighten the too heavy weight which nations less rich could not have supported.

England has aided great Russia; she has aided unhappy Serbia; she has even been able to facilitate for France certain indispensable purchases. She has also come to the aid of her colonies. In different forms, she had lent, in Nov, 1915, about 14,000,000 francs since the beginning of the war. Her expenses, at present, reach 125,000,000 francs a day; she will keep them up to the end. Never will the fictitious credit of Germany conquer the substantial credit of England. And, if it is necessary, as it is everywhere, to husband her resources, reduce luxury and imports; if an effort of privation and sacrifice is necessary, the English people, the most exacting, the most accustomed to comfort, will know how to bend to the discipline of frugality. A new England has been born, where they economize.

Thus the effort of this great people against the common enemy is also, is first, an effort over itself. Let us not be sparing in our admiration for them, nor our faith in them; they give us both so generously; for they have been capable of praising, with such a warm heart, the heroism and resolution of France! We are looking on at this moral mobilization which exalts and unites all the energies of England in the irresistible will to conquer.

English strength is an antique, powerful spring. Slow to stretch, it is now stretched; with a continuous thrust, it will press upon the adversary. Others are more supple, more rapid; none is more robust. The fiber of the metal is flawless; it cannot break.

[The British Army Through German Eyes. Compiled by Thomas F. A. Smith, Ph.D. *Journal of the Royal United Service Institution*, Aug, '16. 7000 words.]

(A number of extracts from German writings, reflecting German opinion of the British Army.)

[The Irish Soldier: His Humor and His Seriousness. By Michael Macdonagh. *United Service Magazine*, Sept, '16. 3400 words.]

(A number of Irish soldier stories.)

See

EUROPEAN WAR—FORCES ENGAGED—GREAT BRITAIN

INDIA (BRITISH) ARMY

**—Army—Artillery**

See also

FIELD ARTILLERY—INSTRUCTION AND TRAINING—GREAT BRITAIN

FIELD ARTILLERY—MATERIEL—GREAT BRITAIN

**—Army—Engineers**

See

ENGINEERS—FIELD OPERATIONS

(Article: "The Work of the R. E. in the Field")

**—Army—Infantry**

See

INFANTRY—INSTRUCTION AND TRAINING—GREAT BRITAIN

**—Army—Officers**

[A Democratic Army in Being; the Future of the "Ranker." By "Ex-Non-com." *United Service Magazine*, Aug, '16. 4000 words.]

In 1912, the Expeditionary Force alone was deficient to the extent of seven hundred officers and the shortage of officers before the war was one of the toughest and most obstinate of the many army problems. This problem was met by talk, by timid measures such as the "registering" of accomplished senior n.c.o. for special reserve commissions, by shuffling about the financial root-difficulty, by reducing the period of training at Sandhurst, by modifying the qualifying certificate examination, by lowering the age limit for admittance to, and raising it for retirement from, the army, by utilizing any and every shift and subterfuge that would postpone resort to the ranks.

To-day England has serving probably enough commissioned "rankers" to supply completely with officers an army the size of the one maintained before the war, and holding almost every position from general downwards. Old quartermasters have been filling with success such highly responsible positions as Officer Commanding a battalion, Recruiting Staff Officer, Assistant Military Secretary, Brigademajor, Deputy Assistant-Adjutant and Quartermaster-General, Aide-de-Camp, and Commandant of an Educational Establishment. The War Office has made service in the ranks with an Expeditionary Force a prime qualification for the commission; and the government, by raising the pay of all subalterns (simultaneously with the abolition of the \$250 per year for three years, which was formerly the distinguishing honorarium of the "ranker" and for which, in view of the former step, no special need now exists) has laid at one stroke the best foundation for the democratizing of the army, by making it possible for subalterns of all classes equally to exist on their pay. Here at last is promised an end of that tyranny and social barrage which money can create for the mortification of merit.

If an officer survives trench-fighting with credit, he may be hailed as a worthy officer, whether of the people or of the aristocracy, and the change has come about as a law of Nature, with the Kaiser as the unwitting match to touch the magazine. Countries so autocratically governed as Germany, Austria and

Russia have long been pointing the way. Russia had brought to pass in 1911 a scheme whereby no fewer than 24,000 n.c.o. (all with the right to pass to the sub-ensign class after examination) were to be promoted from among the ranks of seasoned soldiers by 1915, their pay, bounties, and allowances being suitably increased; and, of course, in France 50 per cent. of available sub-lieutenancies have long been set aside for n.c.o.'s and men, while in Switzerland and Japan, it is practically obligatory for every would-be officer to graduate by way of the ranks. To quote George Meredith, "The absolute class distinctions in the service were perhaps due not so much to the lofty attitude of the privileged classes as to that inveterate and unreasoning spirit of British 'funkeyism' which 'dearly loves a lord.'"

All this was bound to go under the pressure of free education, trade unionism; and a cheap Press; and Labor M. P.'s, who normally regarded the army askance as something inimical to their social interests, were foremost in pleading in Parliament for commissions from the ranks. The most potent factor in the furtherance of reform was the undeniable social, professional and educational improvement in the non-commissioned class, which forced one warm eulogy after another from the lips of England's most eminent generals in recent years. The first stone of the foundation of a democratic army was laid when the practice of appointing officers by open competitive examination was started, which meant an official endorsement of merit and a curb on mere privilege. Above all this let in the clever son of the successful tradesman. Therefore, the principal plank in the platform of the old Conservatives, that social superiority in the officer was necessary for good leadership, was broken down simultaneously with the destruction of the old objection that the sergeant lacked the officer's social pre-eminence. The Duke of Wellington had been the chief exponent of those now effete theories, and it looked as though his mantle were to fall upon Lord Roberts. But the latter showed one side of his greatness in his ability to assimilate new ideas, and in one of his last manifestos he definitely ranged himself on the side of progress by pledging himself to "the democratic system of promotion by merit throughout all the ranks." Lord Kitchener's strong belief in the same principle had been made known some years earlier, and his insistence on its adoption when he drew up his scheme for the Local Defence Forces of Australia and New Zealand is well known. The glory of Anzac is its supreme justification.

The building up of England's democratic army had the help of many factors, e.g. the strong moral impulse created by Germany's monstrosities, the preponderance of the better classes in the earlier rushes to enlist, the conviction that this was a war between nations rather than between professional armies, the danger to the country that made all former class prejudices insignificant, the exclusive county recruiting for many regiments under county officers, which gave a local pride where

esprit de corps was yet lacking, and the enthusiasm kindled in the best Regular n. c. o.'s and ex-n. c. o.'s. who were commissioned or given other special promotion by the dramatic redressing of all their old grievances. On the whole, they have all shown their fitness under fire to command, than which there is not higher praise.

See also

INFANTRY—INSTRUCTION AND TRAINING—  
OFFICERS—GREAT BRITAIN

#### —Army—Organization

[The Composition of the British Army. Extract from "Ordeal of Battle." By Frederick Scott Oliver. *Infantry Jour.*, Feb, '16. 4300 words.]

The total strength in 1912-1913 was 250,000 men, of whom one-half were permanently out of the country, and about 50,000 were not available for war, being recruits and "immatures." The reserves and additional troops, which would be called out in case of a serious war, were so different in character that it is impossible to consider them as one total. The Army Reserve consisted of fully trained soldiers; the Special Reserve consisted of mere boys with a smattering of their trade; the Territorial Army was little more than an organized schedule of human material, mainly excellent, but available for training only upon the outbreak of war, and then limited to home defence. The total in figures is 450,000, but meaningless and misleading when taken without a proper grasp of its various factors.

The first class had served their full time in the army, and needed but a short time to rub off the rust. The others were wholly unfit to take the field upon the outbreak of war, and yet in spite of the inadequacy of its military education, the Special Reserve was relied upon to make up the Expeditionary Force. In round numbers this latter included less than 60,000 men, considerably less than half-made. The Territorial Army, unmade raw material, numbered 260,000 men.

This army of 250,000 was of course inadequate to make good the numerical deficiency of the Triple Entente at the onset of war. If the full force were sent abroad, how were the recruits and the reserves to be trained?

In no profession is the direct personal influence of teaching and command more essential than in that of the soldier. Good teachers and leaders can shorten and make smooth the road to confidence and efficiency as in no other profession. In spite of our clear duty, we not only did not have officers to be left behind for training, replacing wastage, etc., but we faced at the very beginning a serious shortage of officers for the reserve of the Expeditionary Force.

Lord Haldane's plan, placing his trust in a small highly trained expeditionary force, to be supplemented later on if war were obliging enough to continue, was a great gamble even under the most favorable view. Further, to continue, he did not act boldly to make his scheme, such as it was, complete and effective.

Stores were not accumulated, nor were plans

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worked out so as to be in readiness for an emergency. Moral objections to conscription could not apply to inanimate material of war, or to plans and schedules, and it is absurd to pretend that any consideration dictated such a course, other than the desire of the taxpayer to pay as few taxes as possible.

In 1914, Germany's increase in striking force was so great that the value of our aid, in a purely military sense, was much diminished, and from the moral viewpoint was *nil*. England should have had a trained force of from 600,000 to 750,000 men. The German General Staff, whose opinion is usually assumed to be a determining factor in German enterprises, believes that this number would have prevented the occurrence of a coolly calculated war.

The lessons of the South African war were valuable, but the adversaries in Africa are not those in Europe, and the lavish praise given volunteer battalions in 1904 was not properly studied and digested. Would not the nation, if properly informed, have decided that complete insurance was a better bargain than half measures? It was not for ministers or partisans to decide this question for the people; it was for the people to decide for themselves.

**—Army—Personnel**

[Dardanelles General Sent to French Front. News item. *New York Times*, Dec 23, '15. 300 words.]

Official announcement has been made of the following assignments:—

"Gen. Sir Douglas Haig having assumed supreme command of the British forces in France and Flanders, Gen. Sir Charles Monro will succeed him in command of the First Army.

"Lieut. Gen. Sir Archibald Murray, Chief of the Imperial General staff, will succeed Sir Charles Monro (in command at the Dardanelles).

"Lieut. Gen. Sir William Robertson, now Chief of the General Staff in France, will become Chief of the Imperial Staff, with the temporary rank of General, with Maj.-Gen. R. Whigham as his deputy.

"Maj. Gen. L. Kiggell, now assistant to the Chief of the Imperial Staff, will become Chief of the General Staff of Sir Douglas Haig."

[Note. *Army & Navy Jour.*, Dec 18, '15. 250 words.]

The important news has been received that Field Marshal Sir John French, for some reason not definitely known, has been replaced by Gen. Sir Douglas Haig. At his best as a commander of a force not over three corps, the complexities of the new style warfare and the handling of large masses of men brought difficulties for Field Marshal French, and lack of suavity led to trouble with General Joffre and other French generals.

Gen. Sir Douglas Haig is nine years younger, is more progressive, is said to be a better administrator and has the suavity which Field Marshal French lacked. It is only fair to

point out that generals who command in the early operations of closely contested wars pave the way for those who command later.

**—Army—Recruiting**

["Whittling Down." Editorial. *The Army & Navy Gazette*, Mar 11, '16. 1000 words.]

Lord Derby, in the House of Lords, when questioned by Lord Middleton, left it to be inferred that should any great deficiency in men result from the recently introduced scheme it would be due to the inflated list of reserved occupations which the Board of Trade has had scattered broadcast, and to the number of single men who had hastened to get themselves starred and badged. It can hardly be denied that while the bolt-holes which a lax administration had made were many and large, nothing whatever had been done to prevent the escape by their means of an incredibly large number of single men that ought to be serving in the army. As usual, we had set up a mass of machinery and had set no one to mind it. Lord Derby expressed himself as generally satisfied with the work of the Tribunals; on the whole, he thought they were just, and that they were anxious to secure all the men we can legitimately claim for the army. It was admitted that the work of these Tribunals in some cases had been "patchy"; this seems a mild way to put it. The members of these Tribunals are carrying out a delicate and thankless task, and although there is no little justification for appointing to these bodies men acquainted with local conditions, there is evidence that the personal question as well as the local question has entered too much into consideration; this is particularly so in agricultural districts where, because members of the Tribunals have known "jolly old farmer So-and-So" since they were boys, they are anxious that in his old age his country and not he should be inconvenienced.

Lord Derby is anxious to get all the single men possible out of the reserved occupations in which they have sought seclusion; the digging-out promises to be a long and hard job. To get all of these men out of the hiding places in which they are lurking will take much time, while their replacement by suitable married men will not be a task that can be easily and rapidly performed. In the meantime, the war is going on and the game of "general post," which it is proposed to play at the expense of our obligations, can only result in delay in the training of our New Armies and in the production of munitions. Had Lord Derby been given a free hand from the first, all might have been well; but after he had thought out the scheme for the new armies and had begun to administer the recruitment thereof, he was faced with the interfering activities of the Board of Trade whereby trade after trade was closed to the recruiter. It is said that the Board of Trade is now amending its lists, but it would be better if some strong soldier were associated with the department in rectifying its initial egregious errors. The number of new recruits

upon which we ought to be able to count is being rapidly whittled away. While many single men are thus protected from going to the Army, many who are unfitted are being taken; many who have been turned down by the recruiter more than once are now being accepted with open arms. We incur a hideous responsibility by sending to the front men who are known to be unfit, and not providing for pensions in case they break down as they must. We are "whittling away" our numbers at both ends—first, before we get them, through the protection being given to those in reserved occupations, and afterwards by the inevitable breakdown of men who are considered fit for the front merely because they "can handle a rifle."

[Recruiting the British Army. *Independent*, Apr 24, '16. 600 words.]

The British army was 1,400,000 men short of the desired 4,000,000 at the beginning of the year. Volunteers and personal solicitation did not produce enough recruits and the government has begun to apply the draft to unmarried men over 18.

Every effort is being made to reduce the ineligible list. In commercial, clerical and transport work, 275,000 women have been employed, and 14,000 in farm work. This releases about the same number of men for military duty.

The conviction is spreading that it will soon be necessary to resort to universal conscription. No attempt has been made to extend any compulsory measures to Ireland, where there is heated and organized opposition even to volunteer recruiting.

#### —Army—Reserve

[The Training Reserve. Remedial Measures. Editorial. *Army & Navy Gazette*, Aug 19, '16. 1100 words.]

Changes in the method of making up wastage in the units at the front have become necessary. The system hitherto in force has largely grown up during the war. Regular battalions had Special Reserve, and in some cases Extra Special Reserve battalions. These have, on the whole, been remarkably successful in making good the wastages of campaign in the two or more battalions of a regiment. The Territorial battalions had no system of reserve when the war opened, but one speedily grew up, and for each battalion in the field there are now probably two reserve battalions to keep it up to establishment. The Service battalions went directly as units into the active army, but in time reserve battalions were allotted on a certain scale to them also. Thus for each group of the infantry forces—regular army, territorial, and the new army—there were reserve units, whose sole duty was to fill the gaps occasioned by field service.

This system worked well enough even for the very heavy losses of modern war as waged to-day, but it broke down under the extraordinarily heavy losses which some units have experienced, amounting to virtual extinction. In some cases reserve units were called upon

thus to virtually replace units and at the same time meet heavy calls to replace normal but heavy losses in other units operating elsewhere but dependent upon the same reserve units.

To meet this contingency, power was sought and obtained to transfer men extra-regimentally, a very unpopular but nevertheless necessary step.

If the war is to be seriously protracted, a still greater wastage must be provided for among the new troops, less experienced in taking care of themselves. The new proposals provide for the retention of special and extra-special battalions, and certain reserve battalions of the territorial force; all other existing reserve formations are to be combined in a Training Reserve which will absorb all recruits and trained men left over after regimental reserve battalions have been initially made up to establishment, and thereafter maintained by periodical allotments of recruits from the regimental area. As understood, when trained men are wanted at the front they may be taken from any Training Reserve battalion and sent to any unit of any regiment in any expeditionary force. The objection is that large drafts may be sent from a Training Reserve battalion to a battalion that has suffered heavy loss. Such recruits would have no regimental association, and thus regimental spirit and tradition would be destroyed, temporarily at least. To prevent such a condition, the number of recruits sent to a single battalion from the Training Reserve should be limited, and small in comparison with the number sent from the regimental reserves.

#### —Army—Sanitary Service

See

EUROPEAN WAR—SANITARY SERVICE—GREAT BRITAIN

#### —Army—Staff

[The Attack on the Staff. *The Army and Navy Gazette*, Nov 27, '15. 375 words.]

We do not think that even the staff departments themselves would deny that the staff work of the army has for some little time shown signs of deterioration. It is incontestable and unavoidable that the staff officer enjoys rewards altogether out of proportion to those bestowed upon his regimental colleague, in regard to whose work there seems to be little if any deterioration.

Our army has expanded to such unwieldy proportions that it was almost inevitable that our staff, large as it was, could not be expected to keep up with the growth of the army. The result has been that many staff appointments are held by men of small experience and little staff training. There is great disparity in risks and rewards as between the staff and regimental officers. The life of the latter is much shorter than that of the former, hence less chance for "mentions" and rewards. Regimental officers are mentioned, decorated, or brevetted once while their staff confrères often receive such honors several times.

[The General Staff. By General Sir O'Moore

**GREAT BRITAIN—Continued**

Creagh, V.C., G.C.B., G.C.S.I. *The Nineteenth Century and After.* Feb., '16. 4000 words.]

(An explanation of the organization of a General Staff under any system of government, but with particular reference to the English system.—Ed.)

References in the press to the General Staff, its organization and its operation, indicate a lack of knowledge on the part of the public regarding the proper functions of such a body. The explanation here of these matters is intended for the civilian, since all officers who have studied their profession earnestly know its purpose and functioning perfectly well.

In the days when armies were small and their requirements for maintenance few, a small staff was sufficient to meet the necessities. Modern armies are really nations in arms, operating in time of war over an immense territory and requiring enormous quantities of material, all more or less of a technical nature. A small staff can no longer direct the operations of such a machine; the directing body must include men of all trades and professions, in the same way that the staff of a great commercial organization dealing in commodities and activities of every character must include men capable of handling all phases of the business.

No one individual can possibly directly control all the activities of the military machine, some of which are purely commercial, some highly technical and scientific, and some purely military in the sense that they deal with instructing troops and directing them in operations. Hence the General Staff must be divided into branches, each autonomous under its own chief. Each branch consists of many officers highly instructed in the matters pertaining to his division, and one general manager presides over all the branches, to co-ordinate their work, and to prevent duplication and thereby loss of effort. He must be in close touch with the heads of divisions, and to facilitate their co-operation he gathers them when necessary around a council table where matters of general and co-ordinating interest are discussed. Obviously frequent changes in general management are destructive of the best results. Nor is it essential that the general manager should be especially conversant with the technicalities of one or more of the divisions, as he thereby might be inclined to meddle with these to their detriment, and to the neglect of his general supervision over the others.

In a great civil business, results are shown by dividends. If the general manager is not a broad business man, if he allows no freedom of action to his subordinates, if he issues orders direct to their departments, these subordinates lose interest, and the result is shown by decreased dividends. In the military business the only dividend is efficiency; in time of peace this can be judged only by experts; in time of war it is manifested by success in the field with a minimum of loss in men and matériel. If, due to mistaken enthusiasm for spectacular operations which in

reality are subsidiary and which draw the effort away from the center of gravity of the conflict, the strength of the nation is frittered away, this is bad management. If, on the contrary, the advice of the General Staff is sound and to the end of maintaining the effort directly at the center of gravity, this is good management. The results of bad management generally are not manifested until the loss of life, treasure, and national honor bring bankruptcy.

What manner of man, then, must direct these great operations? All great generals have been deep students of the art of war. A close study of history shows at once that we must disabuse our minds of the theory of heaven-born generals. There have been none such. Frederick the Great is said to have remarked to an officer who claimed promotion on the ground that he had fought in all the battles of the Seven Years' War, that "I have a commissariat mule who has done the same—and he is still a mule." Military history amply shows that the most heroic character, unsustained by the requisite knowledge, is practically useless in war except in a subordinate position.

The essential difference between war and other professions is that war is an activity of the will on inanimate matter and on the human mind and human feelings, but against a living and reactive force. He who would successfully direct an army must understand not only his own machine, but the opposing one. Having gone through all the regimental grades to higher command alone acquaints him with military methods.

In constitutional countries, the strength of the army and the money for its upkeep must be fixed by the Cabinet, whose spokesman is the Minister of War; and sanctioned by Parliament. (This applies to the English and similar systems of Government.—Ed.) War being the strongest form of political intercourse between nations, the Minister of War performs the function of linking the political to the military machinery of the nation. He must largely assist in directing political action to secure military efficiency. If this action is correct, results flow; if it is incorrect, and makes demands on the military machine to which it cannot respond, then it is prejudicial to success in war.

The General Staff must be cognizant of the plans of the Cabinet, so that the plans of campaign shaped up may effect the purpose for which the Cabinet gives general directions. The plan of campaign must include a statement of the necessary supplies of all kinds to maintain the requisite force in the field; and also the necessary transport facilities.

Although developments in the theater of war may render necessary certain changes in the plan as originally conceived, the main purpose must be kept in view; and it is obvious that the same person or persons who, in time of peace, have prepared the army, should direct its activities in war. No others will have the requisite knowledge. Hence frequent changes of the Chief of Staff are bad.

The functions of the Minister of War and the Chief of the Staff must be kept separate and distinct. Wisdom dictates that they should not be subordinate one to the other. There should be no dual command of the army, and neither should be in position to interfere with the other.

All communications from the General Staff to the Cabinet should be through the Chief of the Staff and the Minister of War. The latter directs the Ministry of War, which is divided into bureaus for the transaction of its business. Likewise the General Staff, as heretofore noted, is divided into branches. The work of the latter falls naturally under five heads, as follows:

The First Division, under the direct control of the Chief of Staff, draws up general plans of campaign, and is responsible for the promulgation of sound military doctrine throughout the army. It should be divided into the mobilization branch and the intelligence branch, the latter being responsible for the supply of all information regarding every possible theater of war;

The Second Division has the recruitment, training and discipline, including the administration of military law;

The Third Division deals with transport, supply, the quartering of troops, and allied matters;

The Fourth Division is highly technical, and deals with the manufacture and supply of ordnance and ordnance stores;

The Fifth Division is medical, and handles all matters of sanitation.

Such a General Staff as here described is suitable, as all things military should be, for both peace and war. Its organization is simple, and lends itself to easy expansion in time of emergency; but chaos will result with frequent or capricious changes of the direct- ing heads.

To direct oversea expeditions, the General Staff of the Army must work with that of the Navy in drawing up plans of campaign. Success in the landing of an army on foreign soil depends on surprise if the enemy possesses an army of any value.

See also

EUROPEAN WAR—STAFF QUESTIONS

(Article: Wasting the Staff)

STAFF

(Article: "Composition of Headquarters," etc.)

#### —Compulsory Military Service

[National Danger and National Service. By Major T. E. Compton. *United Service Mag.*, Nov, '15. 2000 words.]

The antipathy to compulsory military service is not confined to the working classes. The opposition extends to other classes, and Lord Roberts could awaken little enthusiasm for universal service, because the necessity for it for home defense was not apparent. However, it would have been a serious shock to England to assert that she needed a large army for oversea work.

The objection of the middle class to con-

scription is material, in that it interferes with business, and sentimental because they believe a volunteer is superior to a conscript. Further, they doubt the just application of compulsory service.

But to be of any use, a man must be trained at least six months for the infantry and nine months for the other arms, and as the war cannot last indefinitely, those who are to be of use must be put under training.

The working classes object to compulsory service because they think it will interfere in some way with the activities of the unions. Hence the great effort to persuade a sufficient number to enlist voluntarily to obviate the necessity for conscription. The allegation is also made that compulsory service would *Prussianize* the nation. But republican France and republican Switzerland have conscription, and conscription is in fact used by every European nation except Great Britain, and the character of the service is determined by the character of the government. If that is representative of the people, its measures will remain satisfactory to the people.

[Conscription in England. *Armee Zeitung*, Jan 13, '16. 1400 words.]

Finally, after a year and one-half of war, England introduces compulsory military service, not of her own free will but due to protests and even threats on the part of her allies. She could do nothing else. England's claim that only small nations needed conscription, that she could always create armies when needed, has been cruelly disproven. This is the more startlingly true when one considers the reluctance with which, even now, her population submits itself for training. This "springing to the colors" was the main clause of her argument against conscription and her main reliance for the creation of armies in time of dire need.

Canada and Australia have done their best, and it now remains for England to send her own troops. She has long been reproached for attempting to fight out the war with auxiliary troops. The immense reservoir of humans, India, has not furnished the quota with which England threatened us. Not only have English troops not been withdrawn, but her garrisons in India have been strengthened to protect against native uprisings.

What a spectacle of humiliation England offers as she resolves herself to this bill, sacrifices her much vaunted individual freedom, and admits her short-sighted policy of muddling through. 600,000 unmarried Englishmen, according to Lord Derby's figures, refused to enlist voluntarily in the service!

England does not, even by the introduction of this bill, recognize the basic principle of common service,—that every able-bodied man owes his services to the state in a time of crisis. Furthermore, her leaders in government do not grasp it. A soldier's profession, in English eyes, is like any other paid profession. Now England believes that developments in the trade of war can be regulated by economic conditions, just as in any commer-

**GREAT BRITAIN—Continued**

cial pursuit. This is not true. Resources are not necessarily assets. England cannot develop in a few weeks what she has neglected for many decades. And does England, proud, self-satisfied, blind to history's precepts, feel that 600,000 men are to save the lost game? They are not even trained men. It is her first confession, this bill, that the necessity of the Quadruple Entente is at its greatest,—a confession so interpreted over all the world.

Can you ask of a professional soldier to believe that drafts of not only wholly untrained recruits, but also reluctant, even 600,000 of them, can affect in any way the issue?

After the war in times of peace, there will be leisure time in which England can determine whether the principle of general training is not fully established even for herself. In the making of this resolve, the bitter lessons of this war will aid her greatly.

[The Direction of the War. Editorial. *Army and Navy Gazette*. Feb. 12, '16. 600 words.]

Under an Order in Council of Aug. 10, 1904, the Chief of the Imperial General Staff was given the duty of issuing orders regarding military operations, but these orders required the signature of the Secretary of State for War. When the war broke out, the majority of officers of the General Staff were taken for other duties, and the whole of the work of the Imperial General Staff lapsed into the hands of the War Minister. Even in the capable hands of the present incumbent, difficulty arose. The immense administrative burdens added to the duty of the thinking department of the army might have been carried by one man in normal times, but in war the scheme was unworkable. Although administration has flourished, it is permissible to say that strategy has suffered. The return of Lord French gave opportunity for reorganization. Under a new Order in Council of Jan. 27, 1916, the position of Chief of the Imperial General staff is no longer allotted by the War Minister, but emanates from the Crown. The signature of the Secretary of State for War is not now necessary for each order issued by the Chief of the Imperial General Staff, who may also delegate his duties to his deputy chief. Thus there is at least a complete divorce between administration and strategy. The first rests wholly with the Minister of War; the second, consequent on Cabinet policy, will now rest with a General Staff concerned wholly with strategy.

[Wanted—Continuity of Tenure. (Editorial.) *The Army & Navy Gazette*, Feb 26, '16. 400 words.]

Curious mistakes have occurred in the War Office which go to show that there is a great deal of work going on "in water-tight compartments" without knowing what the man in the same or next room is doing. When the war began all the best men left for more active and important billets, and now the different

sections are no more than temporary halting places for those getting assignments in the War Office, particularly those of the higher grades. They are not to be blamed for seeking work of a more active character, but this absence of tenure of office in the War Office appointments does not make for efficiency and is not in the interests of the service. It should be distinctly understood that any officer accepting a War Office appointment will not be moved for a certain fixed term of months. As matters are at present, and under the existing want of system, the officer entering upon an appointment at the War Office has "to run a show" at the most critical time, learning the ropes as he goes along, while no sooner has he learnt them than he pushes off, making way for another to begin all over again.

["Conscience Corps" Works at the Front. *New York Times*, June 9, '16. 600 words.]

An Associated Press dispatch reveals the fact that the British have formed a "Non-Combatant Corps" to utilize the services of those who have conscientious objections to fighting. The theory is that if they will not fight, they must work.

Under normal conditions, it is several months before a recruit can be given the necessary training to be sent to the front. But a member of the Non-Combatant Corps requires no such length of training. They are given the same pay and rations as the men in the trenches, with the extra allowance of meat given to the laborers' corps.

Conscientious objections to fighting must date back before the war to be recognized as valid.

[The Recruiting Pool. Editorial. *The Army & Navy Gazette*, London, Aug 26, '16. 350 words.]

We have already given our views upon the new Training Reserve, and have emphasized the opinion that a *Pool*, containing soldiers who were no people's children, who belonged to no regiment, had not been imbued with any regimental spirit or tradition, would be found to want an indefinable *something* which has helped to make the new battalions the very fine fighting units they have proved to be. The majority of the commanding officers in the *New Army* seem to regard with something short of consternation the sudden advent into their battalions, after serious engagements, of a large number of men direct from the *Pool*. They may be admirably trained, but deficient in Regimental spirit; even though drafted from a *divisional area*, they will be destitute of one of the finest *moral* qualities of the battalions of the *New Army* as heretofore organized, since they lack a spiritual connection with any battalion they may join. The transfer of men from other units was bad enough, but they did possess a regimental spirit and a knowledge of regimental tradition which were used. The men from the *Pool* will have none of this, and the



advent of strangers in anything but very small bodies will not be greatly looked forward to.

[Raids—New Pattern. Editorial. *The Army & Navy Gazette*, London, Sept 2, '16. 500 words.]

In the early months of the war, we were disgusted at the number of young men who had avoided the recruiter. So long as the authorities held to the voluntary system nothing was to be said or done—the system itself was responsible for the continuance of a state of affairs which was a national scandal and which filled every decent-minded man and woman with shame unspeakable. It was hoped that compulsory service would put a stop to this, that all able-bodied men would be called up and those not immediately required would be "badged," as waiting their turn or as of greater service in the factories at home than at the front. The number of unbadged men has diminished but they have not disappeared, they are in suburban trains, tubes and busses, and the streets and places of public resort. It is unquestionable that the young men have not been all rounded up, that the provisions of the Military Service Act are being so contemptuously ignored as almost to be a dead letter, and that a large number of young men are successfully shirking their military duty. Liverpool has set an example by raiding one of its large parks last Sunday night, closing the exits and holding up all who did not have badges, taking their names unless they could present documentary evidence of exemption from military service, and directing them to report to the recruiting officer under threat of arrest if they disregarded these instructions.

[Obligatory Service, Limited, in England. *La Guerra y su Preparación*, May, '16. 17,000 words.]

(An outline of the project of compulsory service is followed by extracts from the debate in the House of Commons. Mr. Asquith's and Mr. Balfour's speeches are reported.)

[Britain's Shortage of Men. Editorial. *Army & Navy Jour.*, Oct 7, '16. 750 words.]

Again Britain needs men. Even with conscription, 1,600,000 men are exempt. According to Lord Derby, there are 5,000,000 men of military age outside of the army, and 350,000 annually reach military age (eighteen). Trade influences through the Board of Trade have served to extend the exempt classes. Many men are sheltered in the government service. Unless men can be procured by other means, the present age limit (41 years) must be extended. In Germany and in France there is no attempt to evade military service.

See also

GREAT BRITAIN—ARMY—RECRUITING  
GREAT BRITAIN—MILITARY POLICY OF

—Finance

[Great Britain. Finance. *Information*, Aug, '16. Quoted.]

Premier Asquith, July 24, asked the House

of Commons for a vote of credit of \$2,250,000,000. This vote is the largest asked by the government since the beginning of the war, and would bring the total voted in 1916 to \$5,250,000,000, and the total since the beginning of the war to \$14,160,000,000.

The Premier said the recent expenditure out of the vote of credit was approximately £5,000,000 daily. The £6,000,000 daily referred to by Reginald McKenna, the Chancellor of the Exchequer, represented all the outgoing, the Premier said. All the expenditure from Apr 1 to July 22 was £550,000,000.

Mr. Asquith said that the navy, army and munitions cost £379,000,000, the loans to Great Britain's allies £157,000,000, and food supplies, railways, etc., £23,000,000. The average daily expenditure on the war, he said, was £4,950,000.

—History

[Anglo-French Relations. A Study: From the Death of Henry II, 1189, to the End of the Hundred Years' War, 1453. By Major General T. F. Lloyd. *United Service Magazine*, Jan, '16. 4000 words.]

Containing Chapter XV of a serial that is to be continued.

(This series of articles is of historical interest only and will not be further noted.—Ed.)

[Anglo-French Relations. By Major-General T. F. Lloyd. *United Service Magazine*, June, '16. 4800 words.]

(Historical.)

[Islam and England; A Retrospect. By T. Miller Maguire, LL.D., F.R. Hist. S. *United Service Magazine*, June, '16. 4000 words.]

(Historical.)

[Anglo-French Relations. By Major-General T. F. Lloyd. *United Service Magazine*, July, '16. 3600 words.]

(Historical serial.)

[England and Austria. A Retrospect. By T. Miller Maguire, LL.D., F.R. Hist. S. *United Service Magazine*, Aug, '16. 3200 words.]

(Historical.)

[Anglo-French Relations. By Major-General T. F. Lloyd. *United Service Magazine*, Aug, '16. 4000 words.]

(An historical serial.)

[Anglo-French Relations. By Major-General T. F. Lloyd. *United Service Magazine*, Sept, '16. 4800 words.]

(Historical serial from the death of Henry II, 1189, to the end of the Hundred Years' War, 1453.)

See also

BRITISH WEST AFRICA—HISTORY

CRIMEAN WAR

FRANCE—HISTORY

(Article: "Anglo-French Relations")

IRELAND

—Military Conditions in

[Britain's Military Effort. By Hilaire Belloc. *Land and Water*, May 25, '16. 4100 words.]

### GREAT BRITAIN—Continued

The war has lasted not quite twenty-two months. In that brief period of time, Great Britain has produced a military organization almost entirely novel, and constructed under conditions which render it unique in all the history of war.

When the war began, Great Britain was able to put into the field not quite four divisions. The full four divisions of what was called "the Expeditionary Force" were constituted only in the very progress of the fighting. The last complementary units did not exceed the losses already suffered in the first shock, and reached the field only while the third heavy day of action was in doubt.

Even this original body was not in line until the war had been in progress for more than a fortnight. It was a force of professional regulars, and represented very nearly the maximum effort which Great Britain was pledged to *or had hitherto thought possible* in case of a continental campaign.

In May, 1916, just twenty months later, the army in the field numbers *seventy* divisions, so far as the activity of these islands alone is concerned. Not only are these seventy divisions kept at full strength during a campaign of unprecedented wastage, but they have behind them such masses of men, already trained and equipped, as permit the maintenance of units for as long a time as the struggle in its present form can possibly last.

Not only have the numbers thus increased by more than twelvefold, but the total mobilized man-power of the nation has increased at the same time in a far larger proportion; and when the third year of the war is entered it will be found that Great Britain will have turned to the purpose of war, direct or indirect, a larger proportion of her population than any other belligerent country, with the possible exception of France.

To raise and train a body of men is one thing; to provide it with its necessary equipment is another. Under modern conditions it is the second of the two tasks that is the more serious, and the more likely to involve delay. By equipment in this sense is meant the provision of all technical instruments, and, in general, the organization of an army in its fullest development. The immensely increased armed forces of Great Britain are now in that position. Nothing is lacking, save here and there in such things as have been invented during, as have been suggested by, the course of the war itself. The army is now equipped with a solidity and thoroughness of matériel in the true national tradition.

This feat, the multiplication of an army in the field by more than ten in the course of twenty months, and the putting forward of the new formations fully equipped in every detail, is a thing which has not been known before in the history of war.

[Objectors. Editorial. *The Army and Navy Gazette* (London), July 8, '16. 500 words.]

A great deal of unnecessary and unwise sympathy has been displayed by certain ill-

advised members of the House of Commons towards men serving with our armies in the field who have been tried and sentenced for refusing to obey orders. These objectors are unable to appreciate the circumstances under which these breaches of discipline occurred; that they have taken place in active service in the field, where instant and ready obedience is the first necessity for individual and collective existence; that insubordination, if suffered, spreads quickly and produces most evil results, which are worse in a semi-amateur army than in a purely professional force.

We alone of the Allies have adopted compulsory military service while the war is in actual operation, and we alone seem to have been called upon to deal with a peculiar people who, from motives which a majority fail to understand, not only decline to fight for their country, but even to defend women and children. The mentality of these men is of so abnormal a character that those who have had to deal with them have felt a tendency to regard all men who put forward a plea for exemption from doing their duty as cowards, hypocrites, and "slackers," and they have not been able to separate the man of honest convictions of long standing from the man who merely adopts such objections to cover his indifference to the national call. Mr. Asquith has recently stated the steps he expects to take to separate these two classes, and the spurious article is to be treated with the utmost rigor. Even genuine objectors are to be required to undertake work of national importance under civil control, and while they form a section of the Army Reserve they will not be subject to military discipline or military law, *so long as they satisfactorily carry out the duties imposed on them*. All objectors, conscientious and otherwise, will now be used under military or civil control, and thus they, too, will "do their bit."

#### —Military Policy of

[Volunteering or Conscription—Which? Editorial. *Army & Navy Jour.*, Dec 4, '15. 900 words.]

There have been two supreme tests of the voluntary idea in modern times,—our own Civil War and Britain's to-day. In the Civil War drafting was resorted to after two years of fighting. The total secured by draft was small as compared with volunteers, but it stimulated recruiting.

A great many Englishmen believe that compulsory service is coming. Figures show approximately 3,000,000 volunteers from a population of 45,000,000, or about one out of three men of military age. [This is about one out of 1½ physically fit.—Ed.] British recruiting has varied greatly. In London, just after the war began, it reached 1200 a day, falling as low as 150 a day in November, 1914, and reaching 1,000 a day in June, 1915, the highest since September, 1914.

Figures show that Scotland has responded well, and on the whole volunteers have answered nearly as well as in our Civil War. But compulsion is bound to come, because men will not respond fast enough and com-

pulsory service is the only system that distributes the burden of military service fairly.

[War Notes. By Capt. H. M. Johnstone, R. E. (retired). *United Service Mag.*, Oct, '15. 5000 words.]

(NOTE.—This article deals chiefly with home criticism of the military operations.)

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Three chief criticisms have been made against the conduct of military operations: that effort should be concentrated upon the accomplishment of some one thing; that there are too few general staff officers at home; and that the Home Defense Force has not been properly organized.

The critics insist that Flanders and Artois are the important regions where effort should be concentrated, without knowing the information or real reasons upon which the Gallipoli operations were undertaken, and without realizing that the force on Gallipoli has held by its offensive operations Turkish forces against which defensive arrangements, absorbing perhaps an equal number of troops, would have been necessary elsewhere.

There is not much scope for directing strategic operations from London, and General Staff officers are certainly learning more in the field. Brigades, army corps, and armies smaller than they need be absorb an additional number of staff officers.

As for the Home Defense Force, only such attention should be given to it as can be spared from other efforts of more immediate importance. The Home Defense Force may never be called upon to fight, hence no effort that can be directed toward the work of organizing, training, equipping, and supplying the force on the Continent and at Gallipoli should be diverted to the less important work of preparing the Home Defense Force.

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[War Notes. By Capt. H. M. Johnstone, R. E. (Retired). *United Service Magazine*, Jan, '16. 3200 words.]

A retrospect of the war for the year 1915, and a discussion of English politics during the war with respect to it. A comparison is drawn between the British and German régimes with regard to the efficient control and handling of the latter's resources in manufacturing munitions and war materials.

[Lord Derby's Report. *The Army and Navy Gazette*, Jan 8, '16. 1000 words.]

A careful study of this report shows that the recruiting campaign has not been a profitable one. After reading it, two emotions are aroused in the minds of all Britons: First, a feeling of pride that the voluntary system has already raised about three million men, and that under it nearly three million more have offered themselves as recruits to replace wastage. Second, a feeling of disappointment and shame that over two million men—more than half of whom are single—have evaded attestation.

Lord Derby was struck by the very high

percentage of young, single men who are "starred" or "reserved" and therefore not available for military service, and recommends that the "starring" system be at once overhauled. 651,000 single, unstarred young men failed to respond and many of the cards notifying the grouped recruits to rally to the colors have been returned, showing that these men have either changed their residences or that they gave fictitious addresses.

The government, under the provisions of its promise to the married men, has no right to use them until the single men have been brought in, and it is hoped that this can be done without resorting to conscription.

[Recruiting in Ireland. *The Canadian Military Gazette*, Feb 22, 1916. 300 words.]

The haste in which Mr. Asquith assured the House of Commons that the provisions of his Compulsion Bill were not applicable to Ireland was a surprise to many, and that surprise was increased by Mr. Birrell's answer to Sir John Lonsdale regarding the number of men in Ireland who are eligible for military service as compared to those who have actually enlisted. Of the 392,626 men in the three Nationalist provinces of Ireland only 45,237 or 11 per cent. had enlisted on Dec 15, 1916. On the same date in the province of Ulster there were about 170,000 men of military age, and of these about 50,000 had enlisted.

These figures make it very hard to understand why Ireland with more than half a million eligible men, and only 17% of them enlisted, was not included in the application of the Bill.

[Inadequacy of the British Army. *Army and Navy Jour.*, Mar 4, '16. 1200 words.]

(This article consists of comments on "Ordeal of Battle," by Frederick Scott Oliver.—Ed.)

The account of the failure of the British expedition reads like a report on the defects of the military policy of the United States, and shows clearly the policy we should follow. The English Territorials are organized and maintained on plans like those proposed in the Militia Pay Bill. The Special Reserves corresponded to the proposed Continental Army. Both of these forces failed of prompt mobilization, and England had to depend upon its small regular army.

The total strength of the regular army was about 250,000, of whom half were out of the country and 25,000 to 50,000 were recent recruits or "immatures."

The Army Reserves were fully trained soldiers. The Special Reserves numbered about 58,000 and had merely a smattering of their trade. They were wholly unfit to take the field at the outbreak of war. The term of enlistment was six years and carried obligation to serve abroad. The training requirements, nominally six months the first year and one month in camp in succeeding years, were greatly relaxed in practice. The Special

**GREAT BRITAIN—Continued**

Reserve was therefore insufficiently trained to be sent against the well trained troops of Continental Europe, and, moreover, they would be led by comparatively inexperienced and untrained officers.

The Territorial Army, whose term of service was four years, nominally had fifteen days in camp each year, twenty drills the first year, and ten each year thereafter. In practice, this training was, on the average, much less. The number was estimated at 316,000, but was actually about 276,000. Great Britain was thus unable to strengthen her allies materially on land. The wastage of the small force would be large, especially in officers. The departure of the regular army would therefore leave a dearth of officers to train the reserves and any additional force, as every regular and reserve officer would be required to mobilize the expeditionary force and keep it up to strength during the first six months.

It would be fatal in the end if, as a result of putting too much energy into other things or of false economy, the British navy should begin to lose some of its power. The revival of merchant shipbuilding would itself be an unfortunate thing for England if it should prove to be the beginning of a loss of interest in warship construction.

[Merits of Our Old Military System. By "Rooinek." *United Service Magazine*, Feb. '16. 2800 words.]

Our (the British) military system as it was before the war has been the victim of much adverse criticism. Those who then condemned it have since redoubled their condemnations, and are now vociferous in praise of their own foresight. The fact that the British Army was inadequate to meet the hosts of Germans on the Continent is apparently taken as proof of their perspicacity and as sufficient reason for the condemnation, root and branch, of all appertaining to the ancient order of things.

Until the middle of the nineteenth century our military forces had, with the single exception of the war in America, proved themselves more than equal to our military needs. The gain of an empire that had to be fought for testifies to that. Our difficulties accumulated with the phase beginning with the Crimea and ending with South Africa; but even then, owing to the existing determination, we were also able to force the war to a victorious conclusion. Because of the rapidly changing times our system, in comparison with our neighbors, had become out of date. At the serious alarm sounded by the Boer War efforts were made to revise our system. Such as they were, our forces were made mobile and were well trained. Cohesion was given to the citizen army by replacing the old Volunteers with the Territorial Force. These efforts, and they were many, were justified by subsequent events. Yet they stopped short at the numbers considered essential for a war against a first-class power, and, consequently, the supplies of munitions and

material necessary for such numbers. The land forces of the British Empire, in 1914, were absolutely inadequate for fighting a great continental war. The Franco-German War of 1870 marked an epoch in the history of war and taught one lesson beyond all others, the need of ample reserves behind the first line armies.

England, however, enjoyed the possession of a regular army of no small dimensions, that could serve as a nucleus for future expansion should such expansion be required at short notice. This is a point often lost sight of, and, consequently, the great services rendered by the Regular Army, outside its valuable work in the field from the outbreak of hostilities, are sometimes almost completely forgotten. The expansion of the field units of the Expeditionary Force had been well worked out and all arrangements for bringing them to actual war strength went smoothly in actual practice, so it was quite ready to take the field at once. The twelve years' system, divided into periods of color and reserve, varying according to branch, supplemented by the Special Reserve, insured its readiness. Up to this time it had never been contemplated that our obligations to a continental ally would extend beyond six divisions and one, or possibly two, cavalry divisions.

The Territorial Force, though enlisted for home service only, was now available for use on the continent. Yet before a Territorial or New Army Division crossed the British Channel, the original Expeditionary Force was doubled and the whole maintained at strength. Behind the army in the field the former were hardening fast, and in a comparatively short time the Territorial formations were in line to fill the hiatus that would otherwise have existed before the new ones could be sent abroad. This thoroughly illustrates the value of the citizen soldiers and why the labor expended on them has been justified. Our long-service professional army has given us a far greater force in the field than the German General Staff had contemplated, and it is a fact that only the best regular troops would have served the purpose in the initial phases of the campaign, when the power to maneuver was pre-eminently important.

Whatever the defects of our military system, it did even more than give us a highly trained and mobile army of no insignificant dimensions and the necessary machinery to maintain that army while preparations were made to develop our strength to the full. From its nature, it enabled us to attack the enemy all over the world. A brigade assisted the Japanese in the siege of Kiaochau; expeditions were undertaken against Togoland and the Kamerun; we were enabled to hold our own in East Africa, while a great expedition was initiated in Mesopotamia directly the Turks joined the ranks of our enemies; and all these apart from the operations conducted by the self-governing colonies. As a nucleus for military expansion, however, the existing system did notable service, the same service that the Regular

Army of the United States performed in the American War of Secession. With but few exceptions, the prominent leaders on both sides were men who were serving or had served as professional soldiers. On the contrary, in 1914 the British Army, both first and second line, was organized in the highest formations in which armies are normally counted, while the first line at least had been trained and equipped with the idea of campaigning over the very ground on which it did eventually fight. As there was then no organization to be improvised, it was not necessary to invent but only to go on building with the new material on the lines already defined. As regards the commissioned ranks, there was the reserve of officers, which was of comparatively modest dimensions and was required in the first place to supplement the Special Reserve in filling in the casualties in the regulars. For this it proved invaluable, providing well trained and experienced officers and freeing a certain number of serving regulars to be employed with the new units. The ranks of the Regular Army abounded with excellent non-commissioned officers who could be exploited to the full. Since it was only from a professional long service force that such men could be obtained, its value in the work of expansion is still further emphasized. The Regular Reserves of the rank and file were adequate to fill the cadres on mobilization. However, the twelve years' service was not limited to this use. Large numbers of men still in early life had passed off the reserve and thus provided highly trained and efficient soldiers beyond the actual tabulated resources.

The debt the country owes to the Regular Army is not now appreciated and probably never will be. Yet had it not been for that army, England's rise to great military power within the space of a single year would have been impossible and her position as a power in the world at all would have been in jeopardy. In short and in conclusion, the permanent army has been the foundation of all our present strength.

[The Army Estimates. Editorial, *The Army & Navy Gazette*, London, Mar 18, '16. 1000 words.]

On the subject of The Air Service, Mr. Tennant (House of Lords, 14th Mar) was, perhaps unintentionally, almost amusing. Remembering the statement of condition of our anti-aircraft guns a few weeks ago, members could hardly refrain from laughing when told that the supply of these weapons was better than ever before, and again when told that these guns were actually being used in instructing the gunners to fire at things in the air; when it was stated that our defense organization for London is now complete, that well-known purist, Colonel Lynch, desired to be informed of the exact meaning of that word "complete"; he fiercely demanded to know if it meant that Zeppelins would be prevented from coming. Mr. Tennant naturally declined to commit the Kaiser to an undertaking of this kind, likely

to provoke time-worn pleasantries about "scraps of paper." At the end of his speech, Mr. Tennant read a cheery message from the British commander on the Western Front. The speech was disappointing not only on account of what was said, but also for what he left unsaid; so far as concerns the burning topic of the day—the position of the married men with regard to service—we are still without the information we so greatly desire.

[Muddle and Waste—Army Notes, *The Army & Navy Gazette*, London, Mar 25, '16. 350 words.]

Remarkable revelations are made by the Comptroller and Auditor-General in their reports for the year ending Mar 31, 1915; they show once more the extraordinary difficulty of expanding a thousandfold and suddenly so extensive and important a business as national security; great waste inevitably occurs, a system of check is impossible of satisfactory application, and many openings are afforded for dishonesty. Vouchers are missing or incomplete, final accounts are not rendered before departing for France. Difficulties of purchases, particularly of horses, have occurred. Horses are received at night with no record of origin or destination, and in some easy-going organizations no record is made of receipt or disposal of horses. Much material has been written off as a result of a Court of Inquiry, later to again appear for issue; in some cases threadbare and vermin-infected clothing has come to light after purchase as new clothing. Accounting in an accurate way is impossible, but where checks have been made the discrepancies are large. Public money has been wasted and misapplied, and the way has been opened for malpractices of all kinds.

[The Blockade of Britain, *The Army & Navy Gazette*, London, Mar 25, '16. 1000 words.]

In the House of Commons on Tuesday, Mr. Pringle, the Member for Northwest Lancashire, showed an insight into his subject which is quite refreshing in the House of Commons. He is opposed to compulsory training, not on the ground that the country should not have the services of all its inhabitants, but because he believes there are other ways in which their services might be more valuable to the country. The first mistake was made when skilled navy yard and similar employees were permitted to be enlisted for service—they were more urgently required for ship-building and the manufacture of munitions. When the war began, we threw all traditions to the winds in attempting to enroll armies on an unlimited scale. Mr. Pringle points out that that was not the wisest way to utilize our various resources. Nothing has occurred to indicate that if we could double our man-power in France we would be able to move the Germans out of their trenches. Successes have been accomplished by using masses of material rather than masses of men. Colonel Remington has asserted that we could use men in France after

**GREAT BRITAIN—Continued**

four months training, but it is hoped that for home defense we are depending upon more seasoned soldiers. If not, then it will be somewhat disquieting some morning to get news that the Germans have landed on our shores. Mr. Pringle is of the opinion that the final outcome will rest upon our staying power and conservation of our financial resources. The economic pinch will force the Central Powers to seek peace negotiations, and the matter then presented to us will be whether we can raise the money to continue the struggle, and not how many more men can we put in the field. It is quite likely that Germany will preserve her navy to be used as a menace if we are obliged to hesitate; it may then come to a decisive battle on the seas. Mr. Pringle has reminded us that our expeditions to the Near East have largely increased the burden on our navy, as well as our merchant marine. They have left us, he says, without sufficient navy in the North Sea to attempt any such offensive operations as Sir John Jellicoe outlined recently to the Russian journalists. The military policy of the government has weakened us from a naval point of view; fortunately the navy was relatively so powerful that it has been able to stand the strain. If, however, further blunders are made and men who are needed in the navy yards for repairs, etc., are still deflected to build up larger armies, the time may come when we will not be able to meet in time the emergency for naval reinforcements and repairs. If at the same time our financial credit is impaired, a lasting and conclusive peace may be snatched from our grasp.

[War and Government. By "An Officer." *United Service Magazine*, Apr, '16. 4000 words.]

(A discussion of British economics.)

See also

**GREAT BRITAIN—COMPULSORY MILITARY SERVICE**

[What's Wrong with the War? A Continental Letter. By Robert Crozier Long. *Fortnightly Review*, Apr, '16. 6000 words.]

There have been many defects in thinking and talking of the war. It is known to all that the Allies do not think of peace, but this is not sufficient. The only real threat to the Central Powers is a more effective conduct of the war, based upon a true conception of aims, policy, and strategy.

A neutral (Dane), in conversation, said that doing well in war is not enough. War must be conducted at the highest conceivable national tension.

England entered the war without any accurate conception of the means with which, and the extent to which, she would engage in the war. There was, and there persists to-day, an incredible confusion of political thinking. From hundreds of official utterances we cannot extract a consistent theory of the war. Some believe the war an excrescence upon national life, to be fought out with as little

inconvenience as possible. Others see it as involving national existence. But the view expressed is colored by the point at issue for the moment. When recruits are needed, national existence is at stake. When pessimists clamor, officialdom speaks of our unassailable position. The same confusion prevails in the military sense. If it is a question of preparing the means for beating the enemy by military superiority, action is paralyzed by the suggestion that there is another and easier way—by economic pressure. The conduct of a field campaign may be ruined by faith in some alternative method of achieving victory.

With the suggestion of peace through economic pressure comes the question whether it has ever been ascertained accurately whether this can be done. No General Staff would promise to beat the enemy's armies unless they found out about his numbers, equipment, discipline, and command. No adequate steps were taken to ascertain the exact facts in regard to Germany's peace and war consumption, home production, probable importations, and other like information bearing upon the efficiency of economic pressure.

Actual starvation of Germany can no longer be expected. If so, Russia will "come back," we are "already superior" in the west, hence starvation is unnecessary. But failures in the field are discounted by the vague promise that Germany will be starved out. Nothing would so nerve the English people to the true purpose of war as the conviction that it cannot be won by economic pressure.

The weaknesses are those of politics—all things to all men. There are no plans as to time, place, or means of success. Although there is contempt in Parliament, on the platform, and in the press for nearly every branch of our war-making, yet we expect by this same kind of war-making to achieve success. Important military facts are revealed, such as those in regard to munitions, air defenses, etc. The Germans make no predictions of coming offensives, or of the coming end of the war.

This war has been "a war of silver bullets," a "war of resources," of "attrition," a "war of mechanism," a "war of positions," and just now it is a "war of munitions." This last catchword is likely to prove the most deadly, particularly when paraded as a certain principle of victory. It has had its use in increasing the output of munitions, but the war has been full of operations which have been won or lost independently of shell supply. The Russian general Radko Dimitryeff told (the author) on the Dunajec, shortly before the unlucky battle of Gorlice-Tarnow, that he had plenty of shells; and most Russian retreats, and many other retreats in the war, were not at all determined by shortage of munitions.

The shortage of munitions is, of course, due to shortsightedness somewhere, but meanwhile the "war of munitions" catchword fosters the idea that mechanism will do what man was meant to do. The Germans have no catchwords.

Probably a really serious military disaster

would convince (the British) that there is no magic way to win the war. Probably the war can only be won by military means, by putting into the field better armies than the enemy's, led by better generals. "This is a war of War."

[British Power. By Frederico Oom, Lieut-Col. Eng. *Revista Militar* (Portugal), May, '16. 1600 words.]

In 1910, the *Revista Militar* published some of the strategic and political considerations of war in general. The author of these considerations was Gen. G. F. R. Henderson, professor of the Staff College and of the Royal Military College, who took a distinguished part in the war in South Africa. His history was not completed at the time of his death in 1903, but his deductions as to humanity have been proven to be correct by the events of the past two years. Gen. Henderson defended the necessity of a strong army in addition to a predominant navy. His contentions were that an army to be strong does not necessarily have to be large in numbers. In the light of events, these words seem to be prophetic.

Great Britain's national life depends upon keeping open the seaways for her commerce. Gibraltar, Malta, St. Lucia, Aden and Egypt demonstrate clearly this necessity, but Antwerp stands before all these in importance. Allison the historian describes fully the influence of this port over the destinies of Great Britain. Antwerp is the key to a great estuary admirably adapted to the creation of a vast maritime arsenal. Philip of Spain and Napoleon demonstrated this.

The security of India has been as strong a motive with England as any other.

In 1670, Charles II made an alliance with Holland to protect Antwerp from the French; in 1704, Queen Anne declared war with Louis 14th; in 1742, Lord Chatham made an alliance with Prussia; all with the object of protecting Antwerp.

The events in Europe will not materially alter the main situation. The means of action and the actors in the drama change, but humanity remains about the same.

See also

GREAT BRITAIN—COMPULSORY MILITARY SERVICE

PREPAREDNESS FOR WAR—MOBILIZATION OF NATIONAL RESOURCES—GREAT BRITAIN

—Munitions

See

MUNITIONS—MANUFACTURING FACILITIES OF—GREAT BRITAIN

—Navy

[What Sea Power Means to England in This War. By A. C. Lant. *Review of Reviews*, Dec, '15. 5000 words. Illustrated.]

The fleets of Germany and Great Britain are only sixteen hours apart, yet silently and mysteriously the British fleet has done its work. It has guarded the transport of the army and its supplies to the various theaters of operations, and the return of the wounded and protected the vessels carrying food and munitions to Great Britain from neutral coun-

tries. To Germany it has meant the extinguishment of foreign commerce, and the internment of 170 ocean going vessels in foreign ports. One Allied submarine in the Baltic is of 5400 tons, with a cruising radius of 18,500 miles, carrying 60 torpedoes. The average loss of the British merchant fleet has been one and one-sixth ships per day. England has 3000 trawlers and motor boats patrolling the North Sea in search of submarines.

Zeppelins have accomplished more than has been credited to them. They have hovered over the North Sea and have done much in the defense of the German coast.

Fighting is now at extremely long range. The *Blücher* was struck at 10 miles. The action off the coast of Chile was opened at 12,000 yards.

It takes time to train the crews of battleships on account of the enormous complication of their mechanism. Five years is regarded as the time necessary to train a crew. A nation cannot afford to have a battleship worth ten or fifteen million dollars in the hands of a green crew.

The question of the submarine vs. the battleship is as yet undetermined. For the present, the submarine has not superseded the battleship. Defensive measures have seriously crippled Germany's submarines. The majority of the submarines captured in nets have been sunk and left at the bottom five days before being towed in. Yet they have taken their toll, more particularly in the early days of the war. At the outbreak of the war, mines were strewn all over the North Sea by the Germans. Trawlers and mine sweepers have worked night and day clearing them out, not, however, with sufficient success to prevent the sinking of a considerable number of vessels, and not without loss to the trawlers and mine sweepers.

Raids have been attempted on both sides. The only one with important consequences occurred on Jan 24, 1915, when a German raiding squadron visited the English coast. A running fight ensued in which the *Blücher* was sunk and two German battle cruisers badly damaged. It was an action fought at a range of 17,000 yards and 20 knots speed. Speed and gun power won for the British. The one thing that stands out is that sea power remains what it has always been,—the deciding factor.

The British navy has been built and maintained only by a tremendous expenditure, but the cost has been justified by its results.

[Admiral Beatty's Warning. *The Army and Navy Gazette*, London, Feb, '16. 1300 words.]

The complacency with which so many Englishmen regard the war is the result of the protection furnished by the British fleet, and it is feared that this very security may result in a paralysis of effort on behalf of the Navy by the people. The need of this effort was increased rather than diminished at the outbreak of war, for the events of hostilities revealed many new requirements.

It is an overstatement of fact to say, as

**GREAT BRITAIN—Continued**

did a recent member of Parliament that "*The Allies have achieved absolute superiority*" at sea. Only recently seven British vessels were seized and sunk within a week. This was in the Atlantic, and despite the many allied war vessels patrolling that ocean. These incidents go to show that the superiority exercised by the Allied fleets is virtual, not active. To possess absolute naval supremacy the Allies must destroy the enemy's naval forces. A naval defeat for the British would be irretrievable, yet to speak of absolute superiority on the seas suggests the idea that such a possibility is too remote even to prepare against. This is a state of mind most carefully to be guarded against and is the result of the "stupor of self-satisfaction and complacency in which England's flourishing condition has steeped her."

It would be fatal in the end if, as a result of putting too much energy into other things or of false economy, the British navy should begin to lose some of its power. The revival of merchant shipbuilding would itself be an unfortunate thing for England if it should prove to be the beginning of a loss of interest in warship construction.

[From the Thames to the Tigris. By T. Miller Maguire, LL.D., *United Service Magazine*, Feb., '16. 1600 words.]

(On the advantages of England's control of the sea.)

**—Sanitary Service**

See

**SANITARY SERVICE—TRANSPORTATION OF SICK AND WOUNDED**  
(Article: "With the Wounded in Egypt")

**GREECE****—Military Topography of**

See also

**SALONIKA—TOPOGRAPHY**

**GRENADES**

[Experiments with Grenades and Grenade Mortars. By Lieut. R. W. Putnam, C.E. *Professional Memoirs*. Jan-Feb., '16. 1800 words. 1 photo.]

Two mortars are described that were experimented with by the writer. The first type, made of beveled wooden staves wound with wire, was 5 in. in diameter, 3½ ft. long, and weighed 42 lbs. It proved safe for ranges up to 350 yds. with a 1-lb. grenade. To make this mortar, however, required some time and skill. The other type was readily constructed from 5 in. wrought iron steam pipe, ¼ in. thick, and sealed at one end by a wooden plug 6 in. long. This was the most satisfactory mortar devised; mounted at an angle of 45° by means of a piece of 12x12 timber and two uprights, it proved sufficiently accurate and safe for ranges up to 600 yds. with a 2-lb. projectile. The largest propelling charge was 3 oz. of black rifle powder. The pipe was wound with rope to prevent fragments from scattering in case of bursting.

The endeavor was made to find a type of grenade easily constructed from available materials, safe to handle, and designed to explode at impact, or very close to it. Any tin can under 5 in. in diameter makes a suitable container, the bursting charge consisting of ½ lb. of high explosive (rack-a-rock in the tests made). The rest of the can is filled with slugs, so that the whole shall weigh a pound or some multiple thereof.

In firing the grenade, a wooden block of the exact size of the bore, and bored for the fuse, is placed next to the propelling charge. The latter is wrapped in paper, tacked to the block, and ignited through a vent in the mortar. The bursting charge is ignited by means of a fulminate of mercury detonator, into which is crimped a piece of time fuse of length suitable for the range. The grenade proved efficient for ranges up to 500 yds., which is thought to be the limit of accuracy and usefulness for grenades of this type. About 70% of those fired burst within one second from time of striking.

Tables are appended, showing the ranges attained with the different weights of propelling charges, and the proper length of fuse for the different zones.

[The "Mars" Hand Grenade, *Arms and Explosives*, Feb., '16. 650 words.]

From a sample of the "Mars" hand grenade sent by those interested in it, the following description is given.

The iron casing takes the usual form, but there is no external firing apparatus. The firing of the charge is accomplished by means of a string. At one end of this string is attached a ring which fits on a finger and is thus retained in the hand after the grenade has been thrown. The last two inches of the other end of the string, placed in the firing apparatus of the grenade, are coated with a composition equivalent to that laid upon the sides of a box of safety matches. When the grenade has been thrown and has traveled the distance necessary to straighten out the string, the latter begins to be withdrawn. The coated part is drawn across a matchhead with sufficient frictional resistance to ignite it and thus set off the fuse. Thus the ignition of the fuse is accomplished after the grenade has left the hand.

There are three methods of projection provided, the lanyard method, the simple hand throwing and that by means of a handle of rolled fibre. The lanyard method gives the greatest throwing power, but requires an amount of free space around the thrower inconsistent with trench conditions. The best method is by the handle. This handle is 6 inches long and gives a throwing distance of 35-40 yards. It is tubular, the ring end of the firing string being drawn through its interior cavity.

An important feature of the grenade is that its design lends itself to cheap production by plants not necessarily of a highly organized nature.



[Short-range "Bomb Throwers" in the World War. By R. Sbg. *Artilleri-Tidskrift* (Sweden), Parts 1 and 2, '16. 3500 words. 15 illustrations.]

The author describes the improvised hand grenade and bomb throwers actuated by springs, etc., like the ancient ballistas, and those actuated by gunpowder. Among the latter is the celebrated German "Minenwerfer" of 16.5 cm., 25 cm. and 30 cm. or over. This is a comparatively light mortar, throwing an oblong projectile.

The French "trench mortar" is of a much smaller caliber, since the rear end of the projectile consists of a rod which is inserted into the mortar so that the caliber of the mortar may be much smaller than the diameter of the projectile. The latter has also three wing vanes at the rear end to give it rotation and steadiness of flight. The weight of projectile is 30-40 lbs., while the mortar weighs less than 200 lbs. and can be carried by two men. Larger "trench mortars" of this type are also said to be in use.

[The Baker Hand Grenade. *Memorial de Artilleria*, Mar, '16. 300 words. 1 figure.]

This grenade is of the type in which the igniting element is set off by the soldier before the grenade is thrown. Means are provided for varying the time between ignition and the bursting of the grenade.

[Machines for Varnishing Grenades. *Memorial de Artilleria*, Mar, '16. 500 words.]

(A description of the Spray Engineering Company's machines for varnishing grenades.)

[The Handgrenade. By Lieut. F. Richter, Royal Coast Art'y. *Svensk Kustartilleritidskrift*, Part 2, '16. 1900 words and 5 illustrations.]

(A short historical account of the introduction and development of the handgrenade as a weapon of war and of the special troops (grenadiers) that at one time handled it. Also a description, with illustrations, of the Marten Hale and N. W. Aasen types of handgrenades.)

See also

EUROPEAN WAR—MILITARY LESSONS OF THE  
(Article: "Medico-Military Statistics")

—Use of—Grenadiers

See also

GRENADIERS

## GRENADIERS

[Grenadiers: Their History, Dress, and Equipment. By Lieut. Gen. F. H. Tyrrell. *United Service Mag.*, Oct, '15. 5000 words.]

Siege warfare in the latter part of the 17th century led to the use of hand grenades and to the organization of grenadiers skilled in their use, to search the enemy out of their places of concealment in siege works.

The hand grenade was a Spanish invention (*granada*=*pomegranate*), and is first mentioned in a military treatise in 1472. Its use was at first confined to the artilleryists and engineers. In 1667, Louis XIV ordered that

four men in each regiment should be trained as grenadiers, but soon the grenadiers were formed into companies. They were always picked troops, and they occupied the place of honor at parades and reviews.

The uniform of grenadiers has always been distinctive since they were picked troops charged with specially hazardous duty. As siege warfare passed out and gave way to field operations, the need of grenadiers passed, but the title and the distinctive uniform remained. Height alone became the principal qualification. In the Revolutionary and Napoleonic wars, the grenade had ceased to be a part of infantry equipment, being used only in sieges.

In Russia and Prussia, whole regiments were composed of grenadiers, and grenadier regiments with distinctive uniforms remain to the present day. The Horse Grenadiers were reckoned the finest regiment of cavalry in Napoleon's army. They survived the Russian campaign and were the last regiment to retain their formation at Waterloo.

The Grenadier Guards are the only corps to retain the title in the British army. There are two Grenadier regiments in the Indian army, and a regiment of Canadian militia retains the title of grenadiers. Many regiments in the German army called grenadiers were formerly the guards of minor princes. Russia has a whole army corps of Grenadier regiments which form an intermediate class between the guards and the line.

The 17th century siege warfare evolved the grenadier, and the present trench warfare has evolved his counterpart in the bomb-thrower. In the British army, a certain number of men in each company are being trained in the use of hand grenades. The South African War saw the revival of the mounted infantry, and the present war has revived the grenadier.

## GRESIVAUDAN VALLEY

[The Grésivaudan Valley. By Lieut.-Cols. Scipioni and Ago, Gen. Staff. *Rivista Militare Italiana*, Feb, '16. 17,000 words. Maps and diagrams.]

(A topographical and strategical study of this French valley parallel to the northwestern Italian frontier, extending from Sallanches to Grenoble. An abstract is impossible without maps. The authors conclude that it would be a formidable obstacle to invasion from Italy, and a first-rate base for a French offensive against that country. Favored by nature under either hypothesis, the French have taken full advantage of the situation.—En.)

## GUAM

[The Question of Guam. By B. H. Richard. *The Military Historian and Economist*, Jan, '16. 2000 words. Maps.]

In taking over the Philippine Islands the United States drifted into following the footsteps of Spain in assuming a strategical base near Manila. The commercial and administrative value of Manila overshadowed other considerations. The navy formulated its own program for the defense of the islands, and in

**GREAT BRITAIN—Continued**

the selection of a base vacillated between Manila Bay and Subig Bay. Both places offered certain advantages and to both there were certain objections.

A new idea arose with the development of Pearl Harbor, in Oahu; but it is 5000 miles from Manila, whereas Guam is only half as far away.

Never before had Guam appeared to possess any importance, but its advantageous position was soon perceived, the more so when it was found that the island has a deep harbor, with difficult and defensible approaches. The land defences can be held down to a short front and therefore consume few troops for garrison duty. A squadron of submarines and hydroplanes, backed by a few movable guns of the largest caliber, would make the island impregnable. Why not, then, make Guam a naval base and thus link up the California coast with the Philippines? Olongapo, in Subig Bay, and Pearl Harbor, are bases created primarily for defence. Why not use Guam for offensive or counter-offensive operations? Within its 2000 miles radius lies one of the greatest trade routes of the world, along the China coast; and along this same route would pass hostile transports to land an expedition in the Philippines. Likewise, should we grant Philippine independence, Guam would cover the islands from foreign attack.

The defence of the American continent could be much increased by placing another base at Dutch Harbor, on the Aleutian Islands, interlocking within a 2000 mile radius with the positions at Guam and Pearl Harbor.

The weak point of the Guam theory is that there is no national strategy behind it, and no consideration by competent men of national military policy as a whole.

Our navy cannot be employed in the Pacific for its legitimate purpose of a striking force, until a sound general defensive policy is adopted. But at present it is the only thing we have that looks like a defence,—we may neglect our fantastic coast artillery scheme,—and for that reason the American public must be deluded into a false sense of security.

The weakness of the general navy proposition is that the fleet has not attained and cannot attain sufficient freedom of action because of our ineffective military establishment.

It may well be asked how we are to attain a sane basis of national defence when the plans of the navy are one thing, and those of the army another, while the State Department goes its own way with no attempt to consider our military situation.

**GUN PITS**

See

FORTIFICATIONS—FIELD—FOR ARTILLERY

**GUNNERY**

See

ARTILLERY—FIRE

**GYMNASTICS, Military**

See also

BAYONET—INSTRUCTION AND TRAINING

**HAMMOND TORPEDO**

[The News of the Week. *Aerial Age*, Sept 4, '16. 3200 words. 3 illustrations.]

(Only the part relating to the Hammond Torpedo is given here).

The tests of the Hammond radio-controlled torpedo are being conducted and have been very successful. The movements of this torpedo can be controlled from ships at sea, from the shore or from aeroplanes. It has been purchased by the War Department and will be installed in various coast defenses of the United States.

**HANGARS**

—Floating

[The News of the Week. *Aerial Age Weekly*, Apr 3, '16. 720 words.]

The first floating hangar ever constructed for the U. S. Navy is built as follows: dimensions, 60 by 140 ft.; draught 18 inches; hull 6 feet deep, divided into eight watertight compartments. It is made of massive steel girders and has a collapsible superstructure.

**HARNESSES**

—Field Artillery

[English Artillery Harness. By Capt. R. D. Swain, F. A., Mass. Vol. Mil. *Field Artillery Jour.*, Jan-Mar, '16. 1000 words. Illus.]

(Note: This is a description of the English Field Artillery harness as revealed by war orders placed in the United States.)

See also

FIELD ARTILLERY—DRAFT—HARNESSES AND EQUIPMENT

**HAWAII**

—National Guard

See

NATIONAL GUARD—(U. S.)—HAWAII

**HELMETS**

—Armored

[The New British Steel Helmet. Photograph. *Sphere*, Nov 13, '15.]

The photograph shows a ribbed head piece with moderately high crown, and a nearly flat brim of uniform width, apparently about 1½ inches wide.

[The Steel Helmet in Actual Use in the Trenches. *Sphere*, Nov 20, '15. 500 words. Illustrated.]

The "Casque Adrian," so called after its inventor, was issued to the French troops who were to take part in the great Champagne offensive. It has now been supplied all along the line and is worn by all arms. The distinguishing device is stamped on the front. The helmets are low and shallow, and the weight is about one and three quarters pounds. Ventilation is secured by slits in the side of the ridge on top of the helmet. The helmet is painted gray to render it inconspicuous. Over 2½ million helmets are now in use. The result has been so good in the French army that they are now being issued to the British troops.

[The French Steel Helmet. *Sphere*, Apr 8, '16. 400 words. Illus.]

The helmet weighs  $1\frac{3}{4}$  to  $1\frac{1}{2}$  lbs., and is of steel. Leather and cloth are used in the lining, and aluminum "plaquettes" form the springs between the lining and the interior of the helmet.

A metal head-dress requires perfect ventilation, and this is accomplished by a long narrow opening at the apex under the knob. The helmet is painted grey inside and outside.

The lining consists of a cloth cap, to which is fixed a segment of black glazed leather. One sheepskin provides five linings, hence 600,000 skins have been used to make 3,000,000 helmets. The distribution of helmets began in June, 1915. By Feb, 1916, 3,500,000 had been manufactured.

[The War in Europe. Note. *Army & Navy Jour.*, Apr 29, '16. 200 words.]

The British are issuing 50,000 new steel helmets per month. This helmet remedies the faults of the French helmet. It is a round cap without projections or flutings. Inside are a number of rubber studs to take up the shock of a blow. There is a double lining of felt which acts as a dressing in case of a scalp wound. A stout chin strap is used.

[Notes of the War in Europe. *Army & Navy Jour.*, June 10, '16. 250 words.]

French arsenals can now supply 30,000 steel helmets a day, or 300,000 in ten days. It has taken the English arsenals nineteen months to supply this number. Head wounds accounted for 15 per cent. of casualties in recent wars, and in trench fights the percentage is as high as 25 per cent. In a big fight at the beginning of March, when the English soldiers wore helmets, the penetrating gunshot wounds of the head were less than one-half per cent., and fractures of the skull well under one per cent. of all injuries.

[Military Technical Novelties. By V. E., *Voenny Sbornik*, Jan, '16. 1200 words.]

1. The French army, during the autumn of 1915, was partly equipped with new steel helmets, which were tried out in the fighting in Champagne and in Artois with highly satisfactory results. It was found that these helmets greatly reduced the losses from head wounds in trench warfare, in that when hit by rifle and shrapnel bullets only severe concussions were produced, where before serious if not fatal wounds would have occurred. So successful has this new helmet been that it is now being issued to the cavalry for use in dismounted fighting.

Several million of the new helmets have by this time been issued in the French army. Many of these have been sent to the allied armies for issue and for experiment, the Belgians, particularly, being almost entirely equipped with the new headgear, which in this army has been painted khaki color. The English have also brought out a steel helmet, but of somewhat different shape from the French helmet.

2. The English report that in a recent engagement some thirty lives were saved in a single battalion thru the use of the steel helmet. This nation has started to manufacture these helmets on a large scale by the use of specially designed machinery.

Altho the manufacture of steel helmets would at first appear to be relatively simple, it nevertheless requires 64 distinct mechanical operations. At the present time, five factories are engaged in the making of these helmets, and these factories employ 600 men and 2400 women. The French report that they will probably continue the new style of headgear after the war, with, however, some possible modifications in the shape, with a view of a better appearance for parade purposes.

[Note. *Army & Navy Jour.*, Sept 23, '16. 150 words.]

According to Dr. R. C. Bryan, recently arrived from France, the adoption of the steel helmet has resulted in some bad head wounds just below the helmet protection, due to unnecessary exposure through confidence in the protection offered by the helmet.

[Masks for Sentinels and Snipers. *La Guerra y su Preparación*, May, '16, from the *London Times* of Apr 1. 250 words. Illustrations.]

The Germans have recently adopted a mask for sentinels and snipers in the trenches, made of steel  $\frac{3}{8}$ -inch thick, and weighing about 14 pounds. On the right side there is a cut in the lower part to permit the use of the rifle. The eyeholes are very small,  $\frac{5}{8}$ -inch long and  $1/16$ -inch wide, but they seem to permit a clear sight of the target. This mask is placed on the head in the same way as a fencing mask. Its surface is curved so as to deflect rifle and machine-gun bullets.

## HOLLAND

### —Army—Cavalry

See

CAVALRY—HOLLAND

### —Military Conditions

See also

EDUCATION, MILITARY—HOLLAND

### —Military Policy of

[The Netherlands and the War. *Jahrbücher, deutsche A. u. M.*, May, '15. 1800 words.]

The indications are that, due to observation and experience during the present war in Europe, the national defense system of the Netherlands will be broadened and placed upon a firmer foundation. The people have come to realize that during the long period of peace preceding the war the defensive powers of the country should have been more fully developed.

The outbreak of the war found the country with an insufficient reserve of trained men. Recognition of this shortcoming and of the means of correcting it is apparent in the fact that when the militia class of 1915 was called to the colors exemptions were materially restricted.

**HOLLAND—Continued**

Trained men and new drafts called to the colors on account of the war have been on duty many months, but they cannot be relieved and permitted to look after their personal affairs because they cannot be replaced by other trained men. Had the country possessed an adequate reserve of trained men, the burden of military service could have been distributed more equitably.

The strengthening of the military establishment is being largely discussed by press and people. Many different methods are being suggested. However, emphasis is being placed upon the fact that heretofore only a comparatively small proportion of the young men capable of bearing arms have been called to the colors and given military training, and to the further fact that if a larger proportion of the young men had been trained upon arriving at a certain age the present problem would have been materially easier of solution. The indications point strongly toward acceptance of the principle of universal service.

**—Navy**

[The Navy of Holland. *The Canadian Military Gazette*, May 23, '16. 900 words.]

The recent reports of a crisis in Holland are untrue, but it is true that recent German outrages on Dutch ships have caused some speculation as to what the outcome might be, and this has called attention to the sea power of Holland. If Germany could draw Holland into the war and then control the ports of Rotterdam and Flushing, and command the waters of the Scheldt, it would be of great assistance to her, and it may be that she will attempt something of the kind if she continues unsuccessful at Verdun.

The Dutch navy may be called upon either to act as a coast defense at home or to protect the colonies abroad. For both purposes there is a squadron of seven coast defense battle-ships, ranging from the *Kortenaer*, 3500 tons, to the *Zeven Provinciën*, 6530 tons. Their average speed is about 14 knots. In addition, there are four cruisers of value, several gunboats, and the torpedo flotilla. This gives in all about forty vessels. There were last spring six submarines, and since then others, no doubt, have been commissioned.

**HORSES**

[What Do You See When You Look at a Horse? By Harry L. Simonds, late Corpl. Troop "K," 2d Cavy. *Jour. U. S. Cavalry Assn.*, Jan, '16. 1200 words.]

An enthusiastic tribute to the qualities of the horse, and to the part played by the latter in history.

See also

CAVALRY

FIELD ARTILLERY—DRAFT

FIELD ARTILLERY—HORSES

**—Breeding of***Argentina*

[The Army Horse. By Q. Gutiérrez. *Rev. del Círculo Militar*, May, '16. 1000 words.]

(This article treats of the local difficulty

in Argentina of securing suitable colts for rearing for remounts, ascribes the difficulty to improper breeding, and suggests remedies.)

*Austria*

[The Horse Supply of Austria-Hungary. By Capt. A. McIntyre, 4 F. A. *Field Artillery Jour.*, Oct-Dec, '15. 1300 words.]

At the outbreak of the war, there were 4,000,000 horses in the Austro-Hungarian Empire, the greater number of military horses coming from Hungary. The ante-bellum estimate was 600,000 horses, but this like all other estimates was exceeded. There are two royal and seven government breeding farms, containing about 5000 stallions and brood mares of different types. From these breeding farms come the stallions which are put out for service throughout the country. There are 5000 service stallions distributed in about 1500 stations. There is no breeding establishment for the army alone. In time of peace, the military service required about 14,000 horses annually, 40% from 3 to 4 years old and the remainder from 4 to 7. The prices paid ranged from \$120 for pack horses to \$240 for heavy draft. After a horse has completed ten years' service, he is given to a farmer for use, and for five years must be returned each year during maneuvers. After that the horse becomes the property of the farmer without condition. At the beginning of the war, 30,000 such horses were called back into service.

The country is divided into 76 horse districts. A horse census is taken every 10 years. All horses in the district are inspected every two years. Upon mobilization, all suitable horses passed by the board must be delivered within 24 hours at a designated place. The price is stipulated in advance, as is also the number of horses to be required from the district.

**—Care of Wounded**

[Horses in War. *Army and Navy Register*. Jan 8, '16. 450 words.]

A very interesting description of the present day methods of taking care of horses in war is contained in a report of the chief remount officer with the Canadian troops in France.

The organization for taking care of the 6200 horses of an infantry division consists of 12 veterinary officers and one mobile veterinary section of 27 men. These men attend to the horses on the firing line. They work under most trying conditions and often under heavy fire, seeking out wounded horses, applying first aid and rushing those able to walk back to the mobile section or the field hospital.

It is interesting to note that of 607 horses sent in on one occasion to a Canadian field hospital in France, only 12 died. The others, of which a great number would in earlier wars have been destroyed, were either sent back for duty on the firing line or assigned to easier tasks.

Horses' wounds heal more rapidly than a man's, and it has been found that a large proportion of the horses wounded in battle

can be successfully treated and made fit for further good service.

[Veterinary Work in the Army. *Sphere*, Apr 15, '16. 500 words. Illus.]

The work of the Army Veterinary Corps in war is important, and its activities extend from just behind the firing line to the military base. To every division and cavalry brigade is attached a mobile veterinary section (1 officer and 22 men), whose function is to attend sick and wounded horses, and to form the connecting link between the field units and the veterinary hospitals. These hospitals are on the lines of communications, and each is equipped to handle 1000 cases. Here the horses are carefully attended. Operations are under anaesthetic. Cures are sent to the remount depot, others to the convalescent horse depot for further treatment. In one year 81,134 horses were treated in hospitals; 47,192 were returned to the remount department, 4266 died, 4843 were destroyed, and 22,991 remained under treatment.

#### Germany

[A Horses' Hospital. Work of the German Army Veterinary Surgeons. By Dr. Alfred Gradenwitz. *Scientific American*, Jan 29, '16. 2000 words. Illustrated.]

Although railway and motor transport serve many of the needs of an army, many thousand horses are required with every army corps, and the total of horses needed in the belligerent armies runs into the millions.

Veterinary hospitals have, for the first time, been installed in the present war. The task of the veterinary surgeon behind the battle front is to stay the bleeding of wounds, to diagnose the complaint and take necessary measures to remove infected animals, and to treat wounded and sick horses.

One of these veterinary hospitals was installed at Insterburg, East Prussia, at the end of Nov, 1914, where initial difficulties of condition due to occupation of the barracks by fugitives and by the Russians, requiring thorough disinfection.

The hospital comprises five departments, as follows:—

(1) Reception stable, accommodating 60 horses, where patients are kept pending transfer to proper ward. Malleine and blood tests are applied and results awaited before transfer.

(2) Stable accommodating 80 horses, for infectious lung diseases, now used for surgical cases because there are no cases of lung disease.

(3) Shed comprising several sections for horses suffering from or suspected of glanders, or afflicted with mange.

(4) Three stables, capacity 140, 140 and 80 horses respectively, for surgical cases.

(5) Stable for officers' horses, mares and foals, and cured horses awaiting release.

Exercise ground is available.

The staff comprises the chief veterinary surgeon, three veterinaries and two assistant veterinaries, each of which is assisted by two men trained for the veterinary sanitary service,

and a farrier. Each veterinary has charge of at least 100 patients. The general treatment and surgical operations are superintended by the chief veterinary.

Horses with glanders are killed immediately; those suspected are isolated and subject to renewed tests. Incurables are slaughtered. Each patient's record is kept on a board by the manager. Skin, hoofs and legs receive especial care. Cleanliness, ventilation, and disinfection receive careful attention. Individual watering buckets are used. All horses are examined by the chief veterinary at least once each week. Horses ready for delivery are specially fed and prepared for heavy work. By constant watchfulness and frequent malleine tests, it has been possible to exclude glanders, though 103 horses with glanders had to be killed.

1995 horses were received at this hospital between Nov, 1914, and May, 1915, of which 973 were cured, 103 killed on account of glanders, 128 sold to the slaughterer, and 554 remained in hospital. The remainder were disposed of in various ways.

Most operations are performed in a chloral hydrate narcosis or local anaesthesia (produced by injection of a cocaine-adrenaline solution).

148 men of the landsturm, mostly experienced in handling horses, have been detailed for the care of horses in this hospital.

Such a veterinary hospital operates to restore many horses to duty that would otherwise be lost. Money is thus saved to the government, and the veterinary surgeons gain experience.

#### —Diseases of

See also

SURRA

#### —European War Exports of, from United States

[Note. *Army and Navy Jour.*, Feb 26, '16. 200 words.]

The British Government has stopped buying horses and mules in the American market. Hundreds of thousands of animals have been taken abroad in the past eighteen months. The Kansas City market alone has sent 60,000 horses and 120,000 mules to the British army. Veterinarians believe that it will be years before the supply of horses can be readjusted.

#### —Forage for

[Oats. By Captain D. O. Lamb, 10th D. C. O. Lancers. *Journal of the United Service Institution of India*. Jan, '16. 1000 words.]

Oats, generally speaking, is the best grain for horses. It may be safely said that 90% of our horses in India have never tasted oats. Corn is fed instead, partly because of its smaller bulk, an advantage in a service ration, and partly because of its lower cost, four rupees a maund as against five for oats.

If the Government could see its way clear to buy directly from the grower, instead of through a middleman, it is believed that oats could be more cheaply obtained, and once the planter is assured of a good and steady market, the supply of oats to meet all demands will be forthcoming.

**HORSES—Continued****—For Cavalry—Choice of Breeds**

[Breeding Horses for Our Cavalry. By "A Modest Cavalryman." *Jour. U. S. Assn.*, Jan, '16. 1200 words.]

The first question is: What breed or family is most suitable for producing cavalry remounts?

The type selected should have: good disposition; marching capabilities, including capacity to carry weight, rapid walk, endurance, etc.; speed; stamina; strength of constitution; longevity. These qualities are best developed in the thoroughbred, standard-bred, or saddle-bred family, although much can be said for the Arabs. A detailed examination of the extent to which the desired characteristics are possessed by each of the types named indicates the thoroughbred as the most desirable for the breeding of cavalry mounts. He is the horse of whose breeding and performances we have the most complete history, whose blood is purest and who, for that reason, should breed truer to average characteristics. He is the only horse that has been bred strictly on performance, and has accumulated, through many generations, muscular activity, energy and vitality greater than the corresponding qualities of cold blooded horses. If the government is to breed its horses, it must select an existing type or create a special one. An effort to do the latter, even if successful, would take many years.

Assuming that a type has been selected as the most desirable for breeding purposes, it is believed that breeding therefrom in government stock farms would be found more economical and satisfactory than the purchase of remounts from private parties, even when such remounts have been bred by putting government stallions to various types of mares privately owned.

[Interfering. By Vet. B. A. Seeley, 5th Cavalry. *Jour. U. S. Cavalry Assn.*, Apr, '16. 500 words. 1 plate.]

(This is a brief technical article describing the use of a toe-bar on the outer border of the toe of the shoe as a means of preventing interfering.)

**—Identification**

[Identification of Public Animals. By E. O. Trowbridge. *Jour. U. S. Cavalry Assn.*, Apr, '16. 3500 words. Two cuts.]

(A detailed description of a system of identification and records for public animals, with favorable comment on it by various officers.)

**—In European War**

[Horses in the War. By Lieut. v. Cornberg. Abstract from *Sportwelt. Armee Zeitung*, Jan 20, '16. 200 words.]

Both domestic and foreign thoroughbreds are disappointing. For endurance, the East Prussian halfbred is easily the best. The captured English and French horses make good trooper's mounts, the English horses being generally better. The Russian cavalry mount

is well fitted to be an officer's mount. The Cossack horse is extraordinarily tough, is a good weight carrier, and will and can eat anything.

**—Shoeing of**

[Experimental Shoeing. By 1st Lieut. I. S. Martin, U. S. Cavalry. *Jour. U. S. Cavalry Assn.*, Apr, '16. 2500 words. Four cuts.]

(A highly technical article regarding a modified countersunk shoe, designed for use in garrison or under exceptional field conditions, with a view to promoting healthy frog pressure without leaving the horse actually bare-foot.)

[Notes on the Experimental Shoeing of Horses at Fort Riley. By Vet. R. Vans Agnew, 5th Cavy. *Jour. U. S. Cavalry Assn.*, Jan, '16. 5000 words.]

This article is a technical discussion of certain phases of shoeing and is based upon a report made in 1915 by Capt. J. A. Degen, 12th Cavy., in charge of the School for Farriers and Horseshoers, of his experience in conducting a test of the "modified shoe" advocated by the Chief of Staff. The author concludes that "this special form of modified shoe will prove a failure," but advocates experiments with the use of "tips."

**—Training of**

See also

**EQUITATION****—Use of in War**

[The Changed Status of the Horse in War. By Olaf Schwarzkopf, Vet. 3d Cavy. *Jour. U. S. Cavalry Assn.*, Jan, '16. 5000 words. Illust.]

The three propositions following are stated and discussed:

I. The established value of gasoline driven vehicles for army transportation, and their limitations in war.

II. The horse promptly fills the gap left open by the motor car service in this war, and his value increases accordingly.

III. The combatant capacity of the horse is once more established and leads to a new status of his humane protection and economic preservation.

The various gasoline-driven vehicles can travel only on improved roads and highways. Where favorable conditions for their use prevail they save time. Under unfavorable conditions of weather and roads, no motor car can be depended upon for reliable service. Motor vehicles deteriorate very rapidly under the service demanded in war and are very vulnerable to missiles. Beyond their limited sphere of utility, other facilities for transportation must be provided. On good roads and for long drives, the motor truck is very satisfactory, though it deteriorates rapidly. On bad roads and for short hauls, horse power is more economical and much more satisfactory. The latter must, therefore, still supply the principal means of transportation over muddy roads and ploughed fields, across streams and ditches and up steep slopes. Re-

cent experiments conducted at the University of Wisconsin have indicated that, due to the intelligence with which the horse applies his motive force, and to the flexible qualities of the latter, the efficiency of the horse as a traction agent is much higher than the horse power developed would alone indicate.

The heavy purchases of horses made by the belligerents subsequent to the campaigns of the summer and fall of 1914 show clearly that experience in the field caused a renewed recognition of the important place of the horse in the work of war. Since that time, the best estimates indicate that there have been purchased in the United States alone, for use in the European War, about one-half million horses at an average initial price of about \$170, increased by a further cost for transportation, etc., of from \$115 to \$130. This makes the average cost of the horse, landed in Europe, from \$300 to \$315.

If the \$130,000,000 expended for horses as above did not show sufficiently their recognized importance in the face of all competition from motor vehicles, further proof of their essential place in war is to be found in the greatly improved arrangements, visible in all the belligerent armies, for the care and preservation of the animals and for their prompt treatment when wounded. (The article includes a detailed description of the work of the various veterinary corps abroad, and of certain humane societies having as their aim the amelioration of the condition of the horse in war.)

## HORSE EQUIPMENT

—Field Artillery

See

FIELD ARTILLERY—DRAFT

FIELD ARTILLERY—HEAVY—DRAFT

## HOSPITALS

[The Organization and Problems of a War Hospital. By Joseph Marshall Flint, M.D., Professor of Surgery, Yale University. Part I. *Military Surgeon*, Apr. '16. 4900 words. Illustrated.]

The author was in charge of a hospital in the zone of the base in France, this hospital being under the military and sanitary supervision of the French Department of War. It was, however, controlled and supported by a double committee, one in New York and one in Paris. It was originally founded by an American, who had a son serving in the British army. The hospital conformed in organization to a regular French military type, that of *Auxiliaire Bénévole*, and was situated in the Château de Passy, about 60 miles southeast of Paris.

Few foreigners are able to serve in the zone of the advance, most of them serving in base hospitals, where most of the interesting work is done, as the hospitals at the front must be mobile and are, therefore, constantly evacuating to the base. In base hospitals, organization may be fully developed and specialized and any necessary surgical procedure carried out.

In war, the organization of a hospital neces-

sitates the adaptation of many things, not originally intended for such purposes, to the uses of a hospital.

The successful hospital commander will be the one who can best adapt building, appliances and personnel to their new uses and duties.

At the front, only those whose condition is urgent receive surgical treatment; all others are turned over to the transport service, to be sent back to the base. Nearly all of these are suffering from infected wounds when received, as all shell wounds and most rifle wounds are infected.

Carrel and Dakin have investigated this subject, and it is hoped that their studies will reduce future mortality from this cause.

The great problem of a base hospital is the reception of a large number of seriously wounded men within a short space of time, and to provide for their proper handling—bathing, treatment and final disposition. It is necessary either to discharge a patient as cured or to transfer him further to the rear as soon as possible in order to make room for fresh cases. The professional work comes under the following heads: localization and removal of projectiles, compound fractures, infections, nerve lesions, blood vessel injuries, stiff joints, chronic bone infection, frost bite, surgery of repair of the face, operations to render recruits fit for service, as hernias, etc.

The building occupied by the hospital is an old château, the adaptation of which for the purposes of a hospital was rendered more easy because it had been used as a reformatory.

Administration and supply were rendered difficult for the reason that the only town near by is very small and not capable of supporting the hospital. This stimulated the invention and manufacture of appliances within the hospital.

In organizing the hospital, a graphic two-color chart of the departments and personnel was found very useful.

The seventh division of the Ministry of War has charge of all hospitals in the French army. From thence orders come down to the hospitals through the Director of the Sanitary Service of the army corps located there. The military system of one entirely responsible head for each hospital prevails. Usually an administrative officer is detailed by the War Department.

The departments of this hospital were: housekeeping, including kitchen, laundry, carpenter shop, etc; *Economat*, or storerooms; motor transport; stores and supplies; office, including all clinical records; sanitation; nurses and orderlies; discipline, including post office and pay; surgical, including pharmacy, wards, laboratory, X-ray, operating and sterilizing rooms, recovery ward, etc.; fire department.

Military surgery is surgery of adaptation, and the efficiency of a hospital and of the chief of the sanitary service of any region may be measured by the adaptability of the personnel in using the means at hand.

## HOSPITALS—Continued

The wounded are brought back from the front in three kinds of trains—regular hospital trains, passenger trains, and specially prepared trains of freight cars. Most patients arriving at base hospitals have had no treatment except first dressings.

On the arrival of the trains at the base, the cases are sorted and assigned to hospitals by an officer who meets the trains for that purpose. The hospitals assume liability for the patient at the moment that he is transferred from the litter on which he arrives to one belonging to the hospital.

Most patients are suffering from shock. This large number of seriously wounded men can be cared for only by having a receiving ward, where they are bathed, freed from vermin, and their soiled clothing removed for disinfection. Here also their complete medical and surgical history is recorded, a sketch of the injury made, and anaerobic cultures made from all wounds.

Patients are kept in the receiving ward during the critical period of their wounds, and are then transferred to the regular wards of the hospital.

[The Organization and Problems of a War Hospital. By Joseph Marshall Flint, M.D., Professor of Surgery, Yale University. Part II. *Military Surgeon*, May, '16. 4900 words. Illustrated.]

The hospital in question is a military hospital sustained by the French Hospital of New York at Chateau de Passy, France.

Wards are on upper two floors and have American beds. On the first floor are small wards, septic operating room, and an "extension room," in which are special fracture beds and means for all types of extension in the treatment of fractures.

Infections are one of the great problems of this war. In the second Balkan campaign, most wounds were due to rifle and shrapnel balls, and infections were relatively few, due mostly to the fact that the campaign was carried on in the dry season. In the present war the proportion of bomb and shell wounds is much greater, and all classes of wounds are more often infected. The percentage of infections, especially gas gangrene, is greater in the wet seasons. In one advance in Champagne which was made in the rain, more than 80 per cent. of all wounds were infected.

At the present time, the medical service at the front is administering tetanus antitoxin to all wounded. In spite of this precaution, however, some cases have developed as late as four months after healing of the wound.

In treating infections, all approved treatments were used, and special investigations were carried out as to the action of gentian-violet. This substance was found to have a selective antiseptic action on all gram positive organisms, when applied in very dilute solutions, and at the same time to have a stimulating effect on tissue growth. These facts were proved in actual use, and it was found that a solution of 1:5000 produced the most

favorable results. It cleans up infected wounds more quickly than balsam Peru, and is equally useful in an ointment of 1:500 to 1:5000.

In the treatment of osteomyelitis, the fistulæ were injected with a saturated solution of methylin blue, and it was found that the cases made good recoveries when all tissue that was stained had been thoroughly removed. The after treatment was irrigation with gentian-violet solution to prevent reinfection.

Anaerobic cultures and smears were taken from all wounds. This is very important, as some cases show the organism of gas gangrene to be present, but do not show symptoms, as the necessary anaerobic conditions are not present. The treatment of gas bacillus infections is: free incisions, light packing, and constant irrigation of gentian-violet solution combined with hydrogen peroxide.

Compound fractures are the most difficult problem of a base hospital, due to the frequent presence of both extensive splintering and infection. It is necessary to have a large variety of apparatus for suspension and extension in order to treat these cases properly and in comfort.

An efficient X-ray department is most important. A modern, powerful, high-speed equipment is necessary. Location of foreign bodies cannot be done by the use of plate records alone. It is necessary to use some form of localizer, and two methods, used to check one another, give better results than any one alone. The frequent use of the fluoroscope with the localizer was found necessary.

A vibrating magnet, actuated by a rapidly alternating current, was found to be very useful in localizing rifle balls and shell fragments. It is useless in the case of shrapnel bullets, as they are made of lead.

A base hospital is best fulfilling its function when it turns out the greatest possible number of men capable of returning to the front. In order to accomplish this, it is necessary to have a department of mechanotherapy, where stiff joints can receive the varied mechanical treatment as required in each case, in order to restore mobility. This mechanical restoration of function of joints is required after nearly all cases of fracture or infection of any extremity.

The electro-diagnostic and therapeutic department was found to be an important aid in large numbers of cases, especially after nerve injuries. So far the end results in most cases of nerve suture have been discouraging.

Disinfection of clothing by means of formalin was used at first, but this was found to be inefficient and has been replaced by steam at low pressure. This is accomplished by leading steam into a heavily built wine cask, in which the clothing is hung. The results are perfect.

The establishment of an *économat* was found to reduce the cost of supply. This is a combined receiving and storeroom for kitchen supplies. Civilian kitchen personnel was unsatisfactory, and was replaced by soldier cooks to advantage.



All expenses were tabulated and daily cost-keeping installed, and patients were maintained at about \$1.25 a day, excluding installation and extraordinary expenses.

Discipline among patients gave little trouble, and was looked after by a line officer of the army.

A recreation room and theater were installed and were much appreciated.

Some time after the beginning of the war, several hospitals became specialized, one for each of the recognized specialties.

The medical department of the army also had a mobile X-ray outfit, mounted on a truck, which went about to the smaller hospitals to do their work.

This hospital was used as a surgical center by several of the smaller hospitals, and when work was light many hernia operations were done for the recruit depots, in order to prepare men for service.

There were in the vicinity central laboratories, but insofar as possible all laboratory work was done in the hospital. The most useful work of the laboratory consisted in taking smears and cultures of all wounds for the gas bacillus.

Inspections were frequently made by medical officers of the army and were very minute and careful.

The French medical men and officers were very courteous and cordial.

#### —Railroad

See

SANITARY SERVICE — TRANSPORTATION OF SICK AND WOUNDED — HOSPITAL TRAINS

#### HOSPITAL TRAINS

See

SANITARY SERVICE — TRANSPORTATION OF SICK AND WOUNDED — HOSPITAL TRAINS

#### HOUSES

##### —Fortification of

See also

VILLAGES — FORTIFICATION OF

#### HOWITZERS

See

ARTILLERY — FIRE — HIGH ANGLE FIELD ARTILLERY

#### HYDROAEROPLANES

[The Development of the Sea-Plane. *Aerial Age Weekly*, Aug 7, '16. 1500 words. 1 illustration.]

(Gives short description of Blériot's biplane built in 1908, which was not successful, and of Curtiss biplane built in 1911 which was the first successful seaplane. Then follow short descriptions of the most celebrated types up to the 1914 machines. Pictures of each type shown.)

See also

AERONAUTICS

AERONAUTICS — LAUNCHING NAVAL TORPEDOES FROM AIRCRAFT

##### —Records

See

AERONAUTICS — ALTITUDE RECORDS

#### HYDROGEN

##### —Production of—For Balloons

[Progress in Aeronautics. By Major H. Bannerman Phillips. *United Service Magazine*, Apr, '16. 3500 words.]

The value of the large rigid airship is obviously so great that it cannot fail to form part of every program of naval construction in future. In the narrow seas the Zeppelin has admittedly been of prime utility in scouting for the Germany navy, and may yet be of assistance in spotting for the guns of their High Seas Fleet, when the day comes for it to be locked in heavy engagement with the British. It would therefore be folly to lose sight of the necessity for providing a fleet of the best lighter-than-air craft which genius can create and money and industry supply, as a means of efficiency and withal economy of power for England's naval forces in time to come. A fleet at sea with airships and sea-planes, or aeroplanes, working in co-operation with it, is bound to have a higher percentage of efficiency and economy of force than one which has to trust to its sea-surface scouting alone. The Zeppelin is more dangerous in its naval aspect than in its aspect on land. Zeppelins can go up to 15,000 feet, and to inflict damage on an airship at that height, moving at 60 miles an hour, requires a very powerful gun and very accurate fire. A fleet without airships which has to meet an opposing fleet whose units have the advantage of co-operation of rigid dirigibles based on inland shelters, but able to come and go and keep station with it, is like a man fighting with one hand tied and one eye closed. Since lighter-than-air craft are indispensable to the Navy, it is a question whether the Air Service as regards its offensive powers is not about to become equal in importance with the Navy for the defense of the British Isle, especially since no measure of passive defense against aircraft can be relied on. In such case both the Army and Navy would have their special units of machines for training and discipline, but the supply of stores could be made by the same authority which would be responsible for furnishing the over-sea fleet. These would be equally wanted as a permanent asset after the war, especially the large rigid air-ships, as defense against continental aggression must be primarily and actively offensive.

If the importance of the large air-ship as a naval auxiliary is so great, it is obvious that both the strictly naval dirigibles and those intended for long distance raids will require enormous quantities of hydrogen, and provision for a constant and adequate supply must be made. The history of the use of hydrogen for lifting aerial machines is interesting in that while heat was used, as in the Montgolfier balloon and other gases were also tried, this particular gas not only took its place as a prime factor in the art of aerostation, but has continued up to the present to hold its own as the most suitable means of levitation for the modern dirigible as used in the present war. The first utilization of hydrogen was by

**HYDROGEN—Continued**

Charles, a French scientist, in 1783, and its manufacture has since become a commercial undertaking. The French, who were the first to use the balloon in warfare, had a company of aeronauts in 1794, and this "Balloon Section" was in evidence at the sieges of Düsseldorf, Mayence, Worms, and Mannheim. Napoleon showed his opinion of aerial scouting by abolishing the unit in 1799. However, the only overhead communication between the observer in the car and the ground at that time was by missives dropped or shot by arrow, and by visual signalling, whereas the occupants of the car of a captive aerostat now have communication by telephone, and can therefore both receive instructions and convey information without loss of time. It is doubtful whether any better gas than hydrogen can ever be found, and any process which will enable England to obtain increased supplies and with the least expenditure of time in the cheapest way, is of vital importance. The original process was by utilizing the action of dilute sulphuric acid on iron, which has held the field against the plan of passing steam over incandescent iron. The latter proved impractical because it was slow, and the retorts holding the iron filings were fragile, while the plant as a whole was unsuitable for transportation with an army.

The acid process was used by both the French and the Germans in the war of 1870-71 for their captive and free balloons. In Godard's modification of this method, the plant is carried in a wagon and includes two hydrogen producers made of iron, coated inside with lead; a washer; a drier, and a small pump, which supplies acid to the producers and cold water to the washer. Each thousand cubic feet of hydrogen uses up roughly 500 lbs. of sulphuric acid, and half that weight of iron, and a two-ton wagon carries a plant capable of producing 5300 cubic feet per hour. The two producers are charged with iron filings and diluted sulphuric acid is continuously pumped through them.

Between 1870 and 1880 a process for producing hydrogen from dry materials was worked out by Majent and Richten, the materials used being zinc dust and slaked lime mixed together. This mixture when heated to redness gives off the required hydrogen, and a sufficient quantity to fill a military spherical balloon of ordinary size can be produced in three hours. During the Russo-Japanese war, the Russian Army used a portable hydrogen producer which depended on the action of aluminum on caustic soda solution. The drawback to this is that it requires an ample supply of water to cool it, and it frequently happens on a campaign that every gallon of water is needed for men and animals. The Spanish used a somewhat similar method. In this case the gas was produced by the action of silicon on a solution of caustic soda, the weight of substance required to produce 1000 cubic feet of gas working out at 325 lbs. This apparatus has the advantage of being very light, but the French army has a

still more portable plant, in which in place of pure silicon a ferro-silicon containing a high percentage of silicon is treated with a solution of soda. In this case it requires only 119 lbs. weight of materials to make 1000 feet of hydrogen, and the process is known as the Silikol. Both of these methods, however, require good supplies of water for cooling, and to that extent are ill-adapted for waterless localities. To meet these exigencies the French "Hydrogenite" came into use. Here the material used is a mixture of finely ground ferro-silicon and soda-lime; which, when air is excluded from it, lights very readily and develops hydrogen freely; moreover, the hydrogen is very pure and the material keeps for an indefinite time at ordinary temperatures, but the actual weight required for 1000 feet of gas is much greater than in the Silikol process, namely, 187 lbs. The generator, in which blocks containing the mixture are placed, is surrounded by a water jacket; the heat of the reaction evaporates the water, and when the combustion of the material in the generator is all but completed the steam produced in the jacket is introduced in the container. This serves the double purpose of increasing the yield of gas and extinguishing the burning material.

Another method is exposing calcium hydride to the action of water. In France this is known as Hydrolith, and is made by passing hydrogen into molten calcium, which retains the hydrogen until it is again released on its decomposition by the application of water, when a tremendous heat is evolved. Rapidity is of the utmost importance for any process of gas production for lighter-than-air craft in the field, because it often happens that apart from the filling of balloons it is required to make good what an air-ship loses during its normal working time. The electrolyte method of water decomposition is one of the most satisfactory in that the hydrogen is very pure and the apparatus requires little attention. Different plants working on this system produce 1000 to 1800 cubic feet per hour. Another apparatus succeeds in producing hydrogen at the rate of over 5000 cubic feet per hour, of great purity and at a cost of only 3s. 4d. to 3s. 6d. per 1000 cubic feet. In this process iron is produced as a porous sponge by the reduction of pyrites residues by water gas. The sponge is acted on by steam when heated to about 817° C., and the ferric oxide produced is again turned to iron by water gas. The same gas is also burned in vertical retorts at fixed intervals instead of heating them from outside, in order to maintain the iron at the requisite temperature for reaction, and the process is divided into three periods, (a) heating, (b) reducing, (c) gas-production. Improved hydrogen producers based on the steam-on-incandescent-iron process have been established at the Zeppelin works at Friedrichshafen and other airship stations. One of the necessary accessories of the producer is a water-gas plant of ordinary construction; but the net cost of the hydrogen produced is low, and it contains less than

two per cent. of impurities. There is a portable hydrogen producer in which the only materials needed to feed it are coke and oil, and it produces 3500 cubic feet per hour. The cost of manufacture has worked out in the past at various prices between two shillings and sixpence as a minimum, and four shillings as a maximum per 1000 feet. It is carried on two railway wagons; the first having two generators, a blower, and an oil tank mounted on it, while the second carries the purifying plant.

Hydrogen is also produced independently at some works as a by-product of potassium chloride and sodium chloride, an auxiliary supply at hand independent of any government production. It is a simple matter to compress the hydrogen in steel cylinders for transportation to any required point. The cylinders in use in Germany now contain about 175 cubic feet of gas and are carried on limber wagons drawn by four horses, the load being 20 cylinders. Twelve wagons are attached to each balloon section. This transports a quantity sufficient to fill a captive balloon twice.

## ILLUMINATION

[The Aga-Light for Military Uses. By S. E. A. From *Tidskrift i Fortification*, parts 3 and 4, '15. 5500 words, 14 illustrations.]

The Aga-light—the name of a Swedish gas accumulator—is doubtless the best of the late discoveries in the way of acetylene-light illumination.

The source of this light consists of *dissoûs-gas*—acetylene dissolved in acetone—and Engineer Gustaf Dalén has, by means of noted constructions, made it possible to employ it for various purposes. Acetone can at a temperature of  $+15^{\circ}\text{C}$ . ( $+59^{\circ}\text{F}$ .) and pressure of one atmosphere absorb about 25 times its own volume of acetylene and at a pressure of 10 additional atmospheres 275 times its volume, which as the pressure is diminished will be liberated again.

The dissoûs-gas is kept in specially constructed gas accumulators of various capacities from 75 to 60,000 liters. The advantages of keeping this gas in these accumulators is that the acetylene is kept perfectly pure and dry, is always ready for immediate use and may be kept without deterioration for years.

This Aga-light is employed for military purposes in:—

- (1) Searchlights and flash signal apparatus.
- (2) Light houses and location lights for airships.

- (3) Interior illumination.

Also in welding and cutting of metals.

During the winter of 1914-15 experiments were made in Sweden to obtain a portable search light for the infantry that would illuminate up to 700-1000 meters and be light enough to be carried on a man's back, not be affected by changes of temperature, quickly set up, lighted and easily maneuvered and not readily injured in transportation.

The one adopted had a mirror 400 mm. (16 in.) in diameter, was mounted on a tripod and

arranged so it could be readily turned both horizontally and vertically. The total weight of the whole apparatus was 39 kg. (85.8 lbs.) divided for transportation into three packages of 16, 15 and 8 kgs. (35.2, 33 and 17.6 lbs.). It was found to function very well and gave a satisfactory illumination.

Other mountings were also used where it was intended to be used in a fortification.

A larger searchlight of 600 mm. (24 in.) diameter and about 3 million candlepower was also constructed, that was arranged to spread the light more horizontally where desired and this had a graduated scale for both the horizontal and vertical movement.

For military flashlight signalling two apparatuses were constructed, one designed to signal up to 30 km. (18½ miles) and a larger one for coast signal stations up to 50 km. (31 miles).

Portable hand lamps were also constructed for use in the field at night.

The Aga-light has also been extensively used in coast lighthouses and lately some lights have been built to indicate to the airships where to go and where to land at night. These are arranged to give out distinctive flash light signals in order to guide the airships, as for example one gives —..... —..... —..... continuously.

See also

### SEARCHLIGHTS

#### —For Night Attack

[Illumination of Battlefield. *Army and Navy Register*, Nov 6, '15. 250 words.]

Some interesting tests now contemplated by military authorities are those for the development of a portable field searchlight for the use of the mobile Army. The searchlight is already known, of course, to be practically of no value for illuminating the battlefield; but the tests are expected to show that it can be used successfully for blinding and bewildering the enemy.

For the illumination of the field of action, aerial lights must be used. These may be obtained from bombs, or parachutes and other means of suspending a light may be employed.

Practical experiments are also to be conducted in this direction.

[Illuminating Device. By Roberto Ahumada, Captain of Artillery and Recorder of the Experimental Board. *Mem. del Ejército* (Chile), July, '16. 2450 words, with diagrams.]

Captain Ahumada has devised an instrument intended to replace the petroleum lanterns now in use for night firing by the Chilean artillery.

Every battery should be equipped with four of these devices. The device consists of a rectangular leather case attached to the belts of the men. Cannoneer No. 2 carries two, No. 4 of the caisson detachment one, and one is carried by the officer in charge of the battery observation instruments. This one may be used by the battery commander.

The case is divided into three compartments. In two of these three is a dry battery; and in the third compartment the insulated wire and the illuminator or lamp, when not in

**ILLUMINATION—Continued**

use, are packed away. The length of the wire varies according to the necessities of the case and connects the dry batteries with the illuminator or lamp which is a cylindrical brass tube made up of three sections, the center one carrying a 2 1-3 to 3 volt bulb.

Contact is established through a switch which in some instruments is placed on the inside of the top cover of the case, and in others on the exterior, but along one of the sides.

The device is useful not only to the artilleryman, but also to anyone in the field who at night has to examine a sketch, study a position, take down dictated orders, without betraying his position.

**INDIA (British)****—Army**

See also

ORDNANCE—PROVING GROUNDS—INDIA

**—Army—Officers**

[The Indian Army Reserve of Officers. By Major W. E. Crum, Calcutta Light Horse. *Jour. United Service Inst. of India*, July, '16. 5000 words.]

(Discusses and refers to a previous article by Major Ellwood. The reserve at the beginning of the war comprised 28 infantry and 11 cavalry officers. A large proportion of these were retired officers of the regular army. The author's own summary follows.—Ed.)

"Summing up therefore we seem to require:

"(1) A definite pronouncement from time to time by the government of its requirements in the different branches.

"(2) A well-considered scheme of encouragement and training officers.

"(3) A system of registration of all young men coming to the country, these men being previously trained.

"(4) Recruiting committees in the big towns and in the districts who would receive information regarding possible recruits from the registration bureau, and would interview heads of firms.

"If possible, the proposals for the system should be prepared and discussed, so that they can be brought into force immediately the war is over."

**—Army—Organization**

[The Supply of Followers on Active Service for a Battalion of Indian Infantry. By Capt. C. D. Webster, 30th Punjab. *Jour. United Service Inst. of India*, July, '16. 2000 words.]

(Discusses the difficulties that arise in recruiting the necessary followers and in securing servants for officers when troops are ordered on active service, especially abroad. Many followers are discharged as a result of physical examination for active service, and many officers' servants must be left behind. Means are suggested for forming wait-

ing lists so that followers or servants can be secured promptly when needed.)

[Infantry Establishment in the Indian Army. By "Retired Colonel." *Jour. United Service Inst. of India*, July, '16. 1800 words.]

(Presents a scheme of organization based on making the depot the permanent regimental headquarters under a full colonel, and freeing the three linked battalions from all depot and staff work. The author claims that the tenure for average officers. A reserve of junior officers was to be secured by direct appointment from failed Sandhurst candidates or nomination by regimental commanders, these subalterns to pass to the reserve after three years with half pay for ten years. Lists given.)

**—Army—Personnel**

[The Indian Command. Editorial. *Army and Navy Gazette* Aug. 19, '16, 600 words.]

The decision to make a change in the Indian command will probably occasion no great surprise to those who have followed the course of the Mesopotamian campaign. Sir Beauchamp Duff, who succeeded to the command of the Indian Army in March, 1914, is now to be relieved by General Sir Charles Monro, who has done admirable work in France and at the Dardanelles. General Monro knows something, but not too much of India, having served in the Tirah campaign. Gen. Monro will be missed in France, but if a change in the Indian command was necessary, it would be hard to find a better "chief" than he is likely to prove himself.

**—History**

[Indian Military Leaders in History. By Colonel R. G. Burton. *United Service Magazine*, Sep, '16. 3600 words.]

(Historical examples of Indian leaders and arguments to allow Indian officers to rise above the grade of company officer, their present limit of rank.)

**INFANTRY**

[Note, for a rapid survey of the material under INFANTRY, that it is distributed on the pages indicated under the following geographical and subject subheads:

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- Arms—Ammunition, 403
- Arms—Bayonet, 403
- Arms—Clubs, 403
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Note also for much other valuable material on INFANTRY the cross-references, not only after the General material under this head, but also after the material under many of the INFANTRY subheads.]

#### —Arms

[Pistol vs. Bayonet. By George Hall. *Scientific American*, Mar 18, '16. 600 words.]

In case of invasion, heavy artillery could hardly be used by the invader on account of difficulty of transport. Hence, operations might take the form of infantry attack in force against our troops in trenches. Under such circumstances the riot gun with buckshot ammunition would be effective, and counter-balance many bayonets. Similarly on the attack, the automatic pistol would be superior to the bayonet.

[The Machete and the Colombian Soldier. By Lieutenant J. Zornosa, A. *Mem. Estado Mayor* (Colombia), Mar, '16. 1200 words.]

By nature, the Colombian is an expert and enthusiast in the handling of the machete. In all garrisons the art of fencing with the machete should be encouraged, and this training should be part of our scheme of instruction. At maneuvers and in the final stage of combat, the machete should shine. The moral and material effect of this weapon is more decisive and more powerful than that of the bayonet.

We should like for our government to compile a machete manual, and to adopt for our troops a distinctive military machete, to be considered as part of the equipment. In conclusion, we take the liberty to ask the army officers if, in the field, they do not prefer the sharp machete to the weak and ornamental sword, which is a nuisance in a wooded or mountainous country, where the sharp machete would be of inestimable value in clearing the way.

See also

BAYONET

#### —Arms—Ammunition

See also

BULLETS

DUM-DUM BULLETS

#### —Arms—Bayonet

[Bayonet Fighting. By Edward C. Crossman. *Scientific American*, Feb 5, '16. 2500 words. Illustrated.]

The bayonet is a weapon 2000 years old stuck on the end of the latest and highest development in arms. The present war has gone far to prove that infantry is queen of battles. The position of the enemy cannot be taken and held without infantry, and apparently to this is to be added, without the infantryman's bayonet.

The British are paying much attention to bayonet instruction of recruits. Part of the training is to rush a trench and bayonet dummies in it. Dummy figures are suspended by ropes and bayoneted on the run.

(The remainder of the article is taken up by references to bayonet fighting, comparison of modern and ancient tactics, and a popular description of bayonet instruction.)

See also

BAYONET

#### —Arms—Clubs

[The War in Europe. Note. *Army & Navy Jour.*, Dec 4, '15. 75 words.]

It is reported that British troops in Flanders are using in the trench fighting clubs loaded with lead and studded with tacks.

#### —Arms—Grenades

See

GRENADES

#### —Arms—Knives

[Note. *Army and Navy Jour.*, Feb 19, '16. 250 words.]

As a result of close-quarter fighting in the trenches, necessity has arisen for a weapon that can be handled in a cramped situation where a gun and bayonet cannot be used. Dirks are proposed, an idea to which the British did not take kindly at first. Now, however, the French and British governments are confronted by the necessity of supplying knives in large numbers. The French tried a thrusting knife with a loop around the knuckles. A cutting edge and some length of blade, as well as a sharp point have been found necessary. The dirks should be kept in leather sheaths slung under the armpit.

#### —Arms—Rifle

[Rifles for War. By Edward C. Crossman. *United Service Magazine*, Apr, '16. 4500 words.]

The sudden and unexpected need for huge supplies of small-arms ammunition has forced several nations to take what they could get, and other less progressive belligerents to change over to the more modern type of spitz bullet when it could be had. When the war broke out, we know that Germany was by far the best equipped in rifles, though since the first of last year published data on the subject of military rifles has become inaccurate. The Germans had several million of the latest M. 1898-1901, and plenty of ammunition. In addition they had a million or so more of the M. 1888 in reserve, the German Commission rifle of Mannlicher type, and a large number of the old large caliber M.

**INFANTRY—Continued**

1884, a .43 caliber repeating rifle of pre-smokeless ballistics, issued to the Landsturm because most of its members had received training with this ancient arm. With all this, the Germans did not have enough of the new type 1898 Mauser. Photographs of the first line troops in Belgium made in October showed the protruding magazine of the old M. 1888 rifle in the hands of these troops. Their new rifle, the M. 1898, is the best of the rifles in use on the firing line. Its simple and quickly set sight, well protected from harm at all times, its half pistol grip to aid in its manipulation, its long bayonet, its modern bolt action, and its splendid ballistics make it the best of the world's military rifles. It is a charger loader or stripping loader, and the bolt is capable of sustaining the pressures of the most modern ammunition, not to be said of the British Lee. The cartridge gives the spitz 154 gr. bullet nearly 3000 ft. secs., with the flat trajectory and the minimized errors of sight setting and distance judgment that such velocity gives. The old M. 1888 rifle is far stronger than the British Lee, but uses the older type of charger loader in which the charges or clip goes into the magazine and drops out only when the last shot is fired, a type not at all to be compared with the modern type of stripping charger loader. Such a magazine cannot be kept full by the insertion of single cartridges and the clip weighs more than the German M. 1898 charger. The newer type of spitzer ammunition will chamber in the old M. 1888 rifle, but the use of the pointed bullet in the old chamber is a very doubtful procedure, it being more likely that they are furnished with the old cartridge of 2000 ft.-sec. type.

The Belgian rifle is very much like the old M. 1888 German Commission rifle, using the same type of clip magazine, and with a poor cartridge. It is a 30 caliber, firing a 215 gr. bullet at about 2000 ft.-secs. The sight is very crude and not so good as the German late model, which, though by no means elaborate nor adequate to puncture paper targets on a rifle range at long distance, is easily set, self-locking, more protected against blows than a tangent sight, and is easily read by the soldier or non-commissioned officer.

The French rifle is not designed along the accepted lines for military rifles, and its failure to comply with them is an evil point. The cartridge is good ballistically, but the rifle with its tubular magazine, loadable only with single cartridges, makes its rate of sustained fire very low. While it is easily loaded as a single loader, and the magazine of eight cartridges held in reserve, yet occasions may arise when the magazine may be emptied, and still urgent necessity prescribe a continuance of the high rate of fire, with no way to quickly recharge it. It is quite easy to recharge a Mauser magazine and fire all five shots while the French rifle is being reloaded. The mechanism necessary to raise the cartridge from the line of the tubular magazine, and the magazine itself are open to all objections com-

mon to complicated mechanism on the military rifle. The very long quadrangular bayonet gives the soldier a stabbing length of nearly six feet, which is more than the rifle of any other power. There is no handguard, and the rifle must be nearly unusable after a few rounds of rapid fire. The cartridge contains a bullet of 198 grs., pointed like the British Mark VII, and with the stern tapered off from .333 down to .280. Thus it is a boat-shaped or bi-pointed bullet like the Swiss. Unlike the bullets of every other army, this is made of a copper-zinc composition and is solid, without core or jacket. The case, a rim, squatty affair, contains 47 grs. of a flat leaflet nitrocellulose, which gives it 2400 ft.-secs. Because of its high ballistic coefficient, the bullet flies as flat over 1000 yds. as the U. S. bullet with 300 ft.-secs. higher velocity, and it rises but one foot more than the bullet of the German rifle, although up to 500 yds., the German and the American bullet fly flatter than the slower-moving bullet of the French rifle. The bullet is shellacked where it enters the case, and the primer is likewise treated. The chamber pressure is 49,000 lbs. per sq. inch.

The Russian rifle, the "Three Line," or the "Mossin-Nagant," is always accompanied by its bayonet and no scabbard is provided for this long-stabbing, quadrangular bayonet. The gun itself is a modified Mauser, the modifications proving to be detriments. It has a projecting magazine like that of the Ross Mark III to handle the rim shells in single column. They are loaded into the magazine from a stripping charger like that of the British service, and the cartridge case was formerly loaded with a bullet of blunt point weighing 214 grains, and having a muzzle velocity of 2000 ft.-secs. Latterly they have adopted a spitz bullet weighing 170 grains, and having a muzzle velocity of 2440 ft.-secs., nearly the duplicate of the British Mark VII. The chamber pressure is 50,000 lbs., and the ballistics of the cartridge would be practically those of the British cartridge, the bullet being .308 caliber. It is sighted by a crude arrangement of a notched ramp and then a vertical leaf for long range, making the extreme range, as far as sighting goes, 2000 yards. The Montenegrins also use this same rifle. The stabbing length of the rifle with bayonet is two inches less than that of the French rifle and the same as that of the German Mauser. The always fixed bayonet seems to encourage the idea of the bayonet charge, judging by the reported fondness of the Russian infantry for the bayonet. It is also possible that this is the only way it is efficient in their hands.

The Austrian rifle and cartridge are both very efficient. It is an example of the straight-pull type of rifle, used by several of the belligerents, in contra-distinction to the turnbolt rifles of the Mauser type above. In the straight-pull rifle, the bolt is revolved and its lugs freed not by direct application of force to a bolt lever, but by the drive of spiral ribs on its surface engaged by the notch or corresponding grooves in a sliding sleeve, usu-

ally placed around the bolt proper. The handle is attached to the sleeve, and the soldier has only to draw it to the rear. As it moves back, its spiral-helicoid-grooves in which engage the ribs on the bolt compel the bolt to turn, freeing the lugs, giving primary extraction to the case by a slight rearward motion of the bolt in this process, and then drawing the bolt and fired case to the rear. The advantage lies in its superior speed and in the fact that less exposure of the hand and arm is necessary in operating the rifle from a trench or from behind breast-works, while the disadvantages are the slightly increased fatigue of working it for a long series of shots, the lessened extracting power for sticking cases, and the slightly increased complication of mechanism. In this rifle there are two working parts, the bolt, a hollow spindle carrying the locking lugs, containing the firing pin and mainspring, and having helicoidal ribs on its surface; and the sleeve which slides over the bolt and which carries the handle and safety lock, and which has on its inner surface corresponding helicoidal grooves to receive the ribs on the bolt. Powder pressure on the bolt proper does not affect the sleeve, it merely locks the bolt for the instant so firmly that nothing can unlock it while the pressure lasts. Pulling back on the bolt handle compels the bolt to revolve, as the sleeve cannot turn. The pitch of the lugs gives the bolt slight rearward movement, affording primary extraction. As the sleeve moves back about an inch, the bolt is revolved a quarter turn, and it moves back about one-thirty-secondth of an inch with the case. In the backward movement, the cocking piece is carried back with the sleeve, compressing the mainspring. Normally this pressure of the mainspring, trying to force the bolt forward, would tend to jam the bolt-head against the receiver walls, as of course to move forward the bolt must also turn. This is prevented in the Ross rifle by a series of threads on the bolt at the end of the helicoidal ribs, engaging in corresponding broken threads on the sleeve, holding the bolt open against the pressure of the mainspring. On the Mannlicher of Austria the tail of the extractor dips into a slot, holding the bolt from being revolved by the mainspring pressure. The Austrian rifle has a protruding magazine like the Belgian Mauser, and is loaded by an old-fashioned clip of cartridges of the Model 1888 type, the empty clip falling out of the rifle when the last bullet is fired. It has a suggested or half-pistol grip and weighs but  $8\frac{1}{4}$  lbs. without the bayonet. The cartridge, a rim case like the Russian, is loaded with a 154-grain bullet of spitzer type, with the muzzle velocity of 2900 ft.-secs. In caliber, shape and velocity the bullet is therefore the same as that of the German rifle.

Bulgaria uses the same rifle, as do the second line Greek troops, the first line using the Mannlicher-Schonauer .256 caliber.

The Swiss rifle is a straight-pull arm, the bolt revolving by an action rod, working in a tube in the body to the right of the bolt. When it is drawn to the rear the bolt proper

revolves by a tongue working in a helicoidal groove. The magazine, slightly extending from the body of the rifle, holds six cartridges, which are loaded into it from a stripping charger of cardboard. The rifle complete weighs nearly nine pounds. It is one of the most accurate of the world's arms. The cartridge, rimless like the German, carries a bullet of 170 grains, pointed and with the stern tapered off like the balle D of the French. It has a velocity of 2660 ft.-secs. and 47,000 lbs. pressure per sq. inch, yet the ballistics of the rifle are far better than would appear from its muzzle velocity. It is claimed that the bullet rises less than 10 ft. in a range of 1000 yds., and but 22 inches in 550 yds.

Servia uses the 1899 Mauser, 8 mm. caliber, with a pointed bullet of 154 grains, and with a velocity of 2950 ft.-secs. The chamber pressure is 53,000 lbs. The Italian troops are attempting to discover whether or not the .25 caliber rifle is large enough in bore. They use the modified Mannlicher, the Carcano, of 6.5 mm. or .256 caliber. The old cartridge has a bullet of 160 grains, the standard blunt nose 6.5 Mannlicher missile with a velocity of 2350 to 2400 ft.-secs. The latter ammunition uses a bullet of 125 grains, with a velocity of 2850 ft.-secs. This rifle is the only one that uses the old "increased twist" of rifling, common in the days of black powder and lead bullets, but rarely seen with the jacket bullets. The twist commences with one turn in 23 inches and ends at the muzzle with one turn in 7.5 inches. The purpose is to increase the spin of the bullet to preserve its stability at long range. The magazine is the single column clip type holding six cartridges. The bolt is little changed from the Mannlicher turnbolt. The carbine has a folding bayonet that normally lies under the forestock in a cut-out recess and is so light—less than seven pounds—that it can be used in one hand. The light recoil of 6.5 mm. cartridge makes possible the light carbine. An arm of this weight with the French cartridge would prove very uncomfortable to shoot.

The Italian rifle is very crude in workmanship and finish. The same rifle is used by both Holland and Rumania, a Mannlicher of 6.5 mm. or .256 inch. The rifle is nearly the same, in bolt detail, as the German Commission rifle, M. 1888, and it uses the same fixed clip which goes into and forms part of the magazine. The Turks, with a Mauser like that of the Boers, cocking on the closing motion of the bolt, have been furnished by the Germans with spitz ammunition of the latest type, .30 caliber, 154 gr. bullets with muzzle velocity of 2850 ft.-secs. The rifle is stripping charger loading and compares favorably in its ballistics and strength with any of those used by the belligerents.

The Japanese rifle, called the Year 38, is a .25 caliber with a rimless cartridge case, and a light bullet at 2900 ft.-secs. The older cartridge used against the Russians was the standard 6.5 mm., a bullet of 160 grains, and a velocity of 2400 ft.-secs., even then giving them a considerable advantage over the Russian cartridge in trajectory. It resembles the

## INFANTRY—Continued

Italian in appearance, from whom they have taken many of their ideas. The arm weighs nine lbs. with 31-inch barrel. It has the half pistol grip of the German rifle, and a hand-guard extending to the forward swivel. The bolt is practically that of the Mauser, but it has a safety device all its own. The rear sight is a vertical leaf with push-stud locking device for the slide, and graduations of 100 yards. A sword bayonet is used with it, giving it a stabbing length of about 5½ feet. The carbine is an exact copy of the Italian, very light and easily handled by one hand, and with a folding bayonet that lies in a recess in the forestock when out of use. Pressure on a spring stud releases the bayonet, a modified sword in form. It is swung on a hinge at the upper band to position, and locked there by the spring stud engaging a lug on the upper band.

The Spanish use a rifle practically like that of the Boers, a Mauser, firing a 7 mm. cartridge. Lately it has been brought up to date by the use of a 140-gr. spitz bullet with a velocity of 2900 ft.-secs. The Swedes use a Mauser made in Sweden and firing a 6.5 cartridge with a 130-gr. spitz bullet and 2750 ft.-secs. velocity. Norway is still using the old Krag-Jorgensen, a 6.5 mm. in caliber, the same in an older type being used by the Danes, but in 8 mm. or .32 caliber.

The United States uses the short New Springfield, a modified Mauser, for which the U. S. Government paid a royalty of \$1.15 per rifle on about one-half million rifles to the German holders of Mauser patents. It is a charger loading rifle with Mauser turnbolt, but with the bolt lever turned down like the carbines of some of the continental nations. The cartridge with 150-gr. spitz bullet gives 2700 ft.-secs. velocity. By the use of the Du Pont military progressive burning powder, a new powder which opens up new fields to rifle and cartridge designers, the velocity of this rifle is raised to 2925 ft.-secs. with no increase in chamber pressure, and this, too, with barrel of 24 inches, not 30 inches as used on continental military rifles. The rear-sight, a vertical leaf when in position for long range firing, is graduated into 25-yard divisions, and has a wind-gauge. An aperture is provided in the slide for use in target shooting. The weakness of the sight is that too many notches and apertures are in view, and untrained men easily might be confused and use the wrong notch. The rifle and the ammunition are easily the best of the world's small arms from the standpoint of accuracy. American teams armed with the rifle have won at Bisley, Stockholm, and have wrested the Palma trophy from the Canadians year after year.

The Canadian Ross rifle is a straight pull like the Austrian Mannlicher described. The magazine, to handle the rim case Mark VII cartridge in single column, protrudes from the stock of the rifle like the M.1888 German rifle. The rifle now being made is the M. 1910, or Mark III, and differs from those of all

other nations in having a pair of bolt locking lugs cut in the form of an interrupted screw, like the breech blocks of the field and naval guns. This form of bolt was first evolved by Mannlicher in the '90s, and was taken up by the Ross Rifle Co. to withstand the pressures of their very large .280 sporting cartridge. Cutting the lugs into this form distributes the thrust through a larger area of the receiver than the solid form of lug, which merely butts against the two shoulders, and by the use of this greater thrust area, the rifle stands pressures that would jam the Mauser bolt, if not shear off the lugs. There is no comparison between this bolt and the weak Lee-Enfield, though the Ross has yet to prove its merits in actual service. The front sight of the Ross is the only sensible sight in the collection of the world's military rifles,—a broad, flat top, clear cut blade, that can be seen and laid accurately against any background. The rear is another improvement, being a generous-sized aperture close to the eye, and so giving all the advantage of that type of sight. It is set on the receiver bridge, and on the whole this rifle is the strongest of any of the Powers and the fastest in operation.

The British rifle is more or less pathetic. Its ten-shot magazine gives it a high rate of fire for a rush, and it is quickly recharged. But the very weak locking mechanism, locking at the rear of the bolt, with a cut through the receiver into the bargain, forbids cartridges of modern pressures, and so of high velocity. They have done well to get but 2400 ft.-secs.

From the practical standpoint, the chief difference between the old type cartridges and the newer ones like the German M. 1905, the Austrian of the same type, and other spitzer combinations, is that the trajectory height over fighting ranges is just about cut in half. The German rifle rises about 20 inches over 500 yards, not even enough to miss a prone man unless he lies very "prone."

[The Military Rifle. By Douglas T. Hamilton. *Arms and the Man*, Apr 27, '16. Reproduced by special permission from April Machinery. 6000 words. Drawings.]

The military rifle of to-day is an evolution from the matchlock musket or shoulder gun, which came into use in Europe in the fifteenth century and was superseded, in turn, by the wheellock, the snaphance, the flintlock and the percussion gun. The flintlock musket was the first shoulder firearm to be generally used in warfare. It had a smooth bore of large diameter and fired spherical bullets. The invention of fulminate of mercury percussion caps in 1799 brought the percussion lock to the front, displacing the flintlock. All of these early guns were muzzle-loaders.

After the adoption of the rifled bore, in the sixteenth century, attention was directed more to the bullet than to the gun itself. Various devices were adopted for expanding the ball so that it would follow the rifling grooves. Bullets were made with bands, wings, cup-shaped, etc., the development finally leading



up to the bullet of oblong shape. The first marked improvement was made in 1849, when Captain Minié devised a hollow base bullet which was expanded by the explosion of the powder charge.

The first rifled musket had seven rifling grooves, with a twist of one turn in ten feet. To effect an improvement in accuracy, the twist was increased to one turn in 30 inches, but this was unsatisfactory because the bullet was driven across the lands instead of following the grooves. About the middle of the nineteenth century many polygonal shaped bores were tried out, but, owing to the difficulty of producing them, they were discarded. Rifling was again resorted to, and in 1865 Mr. Metford produced a rifle of 0.450 caliber, having five shallow grooves and firing a lead bullet hardened with antimony. The bullet was cup-shaped, expansion being effected by the force of the powder explosion on its base.

#### *Development of Breech-loading Rifles*

Rifles were designed to load at the breech as early as the sixteenth century, but the first practical breech-loading rifle was the Prussian needle gun, invented by Dreyse in 1838 and adopted by Prussia in 1841. In this rifle the breech was closed by a mechanism resembling the turn-bolt of a door. A long needle, carried in the bolt effected the ignition by piercing the base of the cartridge and striking a disk of fulminate contained within. The escape of gas from the breech proved troublesome, but on the whole the rifle was a great improvement on previous designs. It was used by Prussia with marked success in the wars of 1848, 1866 and 1870.

Most of the breech-loading guns of the first half of the nineteenth century were provided with some sort of hinged block which, when turned over, gave access to the chamber. In a few designs the breech was opened by breaking the barrel at the breech end, as in modern shotguns, or by rotating the barrel eccentrically in relation to the breech end; but these were soon discarded owing to the difficulty of preventing leakage of gas.

In the early Terry, Sharpe, Greener, and Westley-Richards rifles, and in almost all of the others invented between 1850 and 1860, the percussion cap was separated from the charge, being placed on a nipple. The flame from this cap had to pierce the cartridge and ignite the charge. All of these guns were provided with rubber washers or tallowed wads to serve as gas checks, but it was found impossible to prevent the escape of gas until about 1866, when Colonel Boxer produced a cartridge with a case made of brass instead of paper. Up to that time all cartridge cases had been made from paper and, consequently, were not gas-tight. The breech mechanism had to be such as to prevent the escape of the gases, and it had been found practically impossible to construct such a one.

The invention of the brass cartridge case gave great impetus to the development of breechloading rifles. The Boxer cartridge was first used in the Snider rifle, adopted by the

British government in 1867. In this rifle the breech block was hinged on the right-hand side and was lifted to give access to the chamber.

The Martini breech mechanism, devised in 1870, was a decided improvement on that of the Snider gun. The block instead of being hinged to lift up, was dropped down by the operation of a lever, as in some of the present-day sporting rifles. When the block was raised the breech was effectively closed. This breech mechanism was applied to the Henry barrel, and the combination was called the Martini-Henry rifle. The barrel was 33.2 inches long, 0.450-inch caliber, and had seven shallow grooves, making one turn in 22 inches. The muzzle velocity was 1350 feet per second.

#### *Modern Rifle Bolt Actions*

The bolt actions used in modern military rifles are of two kinds: (1) those in which the bolt is rotated by raising the bolt lever before the bolt can be withdrawn; (2) those that can be drawn straight back without any rotary movement, known as "straight pull" bolts. Austria, Switzerland and Canada are the principal countries that use the "straight-pull" bolt action.

The Mauser bolt is of the "turn" type. It is locked by lugs on the front end of it, which engage with cam-shaped grooves cut in the receiver. The face of the bolt is recessed to receive the head of the rimless cartridge. The ejector slides in a slot cut in one of the lugs, and the extractor is held in place on the outside of the bolt by a spring collar. The Belgian, German, Spanish and Turkish Mauser breech mechanisms vary slightly in construction.

The Mannlicher bolt action, used by Austria, is of the "straight-pull" type. The bolt proper is a hollow cylinder with ribs on each side which work in grooves in the receiver. Inside the middle portion of the bolt there are two helical ribs which work in corresponding grooves in the bolt head and give it a rotary motion on opening or closing the breech. The bolt head carries lugs on each side and these enter the recesses in the receiver by way of the cam-shaped grooves and support the bolt head in the firing position.

Another "straight-pull" bolt action is that devised by Sir Charles Ross in 1907 and used in the Canadian military rifle. It is a modification of the Mauser bolt coupled with the "straight-pull" feature of the Mannlicher type.

#### *Development of Magazine Rifles*

Weapons known as repeaters were the first really successful weapons that contained a reserve of cartridges. In this class of weapon the cartridges lay nose to base in a tube contained in the butt or in the fore end of the stock and were followed up by means of a spring-controlled plunger. The earliest successful weapon of this class was the Spencer, which was patented in 1860.

The Winchester repeater had its magazine in the fore end of the stock. A bolt, sliding in line with the axis of the barrel, was operated by a lever from below. The hammer

**INFANTRY—Continued**

was cocked by the end of the firing pin when the bolt lever was thrown forward. The shells were ejected by the carrier, which lifted up as they were withdrawn. This rifle was used by Turkey in the Russo-Turkish war of 1877-1878 with marked success.

*Modern Military Rifles*

The first great power to provide its army with a magazine rifle was Germany. In 1884 it converted the 1871 pattern of the Mauser rifle into a magazine rifle holding eight cartridges in a tube magazine located in the fore-end of the stock. In 1886 the French government introduced the first small caliber magazine rifle in the Lebel, which had a bore of 0.315 inches. About the same time multiple loading was introduced by the Austrians in their Mannlicher rifle. It was effected by a sheet steel clip containing five cartridges. The clip was pressed into a magazine and retained by a catch until the cartridges were expended, when it fell out through an opening in the bottom of the magazine.

The development in military rifles has been toward a gradual reduction in the bore, the smallest at the present time being 0.256 inch. This caliber has been adopted by Greece, Holland, Italy, Japan, Portugal and Rumania.

The French Lebel rifle is of the turn-bolt type. The stock is made in two pieces, the butt and fore end being joined to the receiver. It has lately been converted from a tube magazine rifle into one using a charger that holds three cartridges. Its caliber is 0.315.

The German Mauser is the model of 1898. It is of the turn-bolt type. It has a fixed vertical box magazine and is loaded with a charger containing five cartridges. The caliber is 0.311 inch and the muzzle velocity approximately 2900 feet per second.

The Austrian Mannlicher rifle is of the "straight-pull" bolt type. The magazine carries five cartridges held in a clip. The bore is 0.315 inch. The "straight-pull" bolt action can be operated faster than the turn bolt, but has not the same strength.

The Italian Mannlicher Carcano rifle has a breech mechanism which is a modified Mauser action. A clip holding six cartridges is used. The rifling is of the progressive twist type, beginning with one turn in 22.9 inches at the breech end and ending with one turn in 7.5 inches at the muzzle.

The British Lee-Enfield rifle has a bolt designed on the Mauser principle. It is the only one of the rotating bolts that has the locking lug near the rear end. The caliber is 0.303 and the muzzle velocity 2200 feet per second. The magazine holds ten cartridges, and a charger is used in place of a clip.

The Russian Three-Line Nagant rifle is of the turn-bolt type. A charger carrying five cartridges is used. There is no cut-off and the rifle can be used only as a single loader when the magazine is empty. The caliber is 0.300.

The Japan 38th-year rifle was introduced in 1907, and is patterned after the Mauser.

The magazine holds five cartridges in two columns. A charger is used instead of a clip. The caliber is 0.256.

The American Springfield rifle was brought out in 1903 to displace the Krag-Jørgensen. It is almost identical with the German Mauser. The bolt handle is bent down as on the Lee-Enfield. The bullet is of the Spitzer type and is 0.300 caliber. The muzzle velocity is 2750 feet per second.

[Notes of the European War. *Army & Navy Jour.*, Sept 9, '16. 200 words.]

The 2nd and 3rd Canadian Divisions will be armed with the Lee-Enfield rifle instead of the Ross. The Ross rifle is the equal of any service rifle in the world as a target rifle, but is difficult to keep clean on active service.

The Lee-Enfield is shorter, and every inch counts in the trenches. It is also easier to clean, and is a more efficient weapon for trench warfare.

See also

MAUSER RIFLE

ROSS RIFLE

—Arms—Rifle—Automatic

See also

MACHINE GUNS

—Arms—Rifle—Ballistics

[The Calculation of Rifle Pressure. By F. W. Jones. *Arms and Explosives*. Nov and Dec, '15. 3800 words. Tables formulae and diagram. To be concluded.]

A reliable formula for calculating rifle pressures is needed to forecast conditions in design, though such a formula would not replace pressure experiments where they are practicable.

Any empirical formula is supposed to be correct within the limits of the experiments upon which it is based, and should give reasonably satisfactory results for conditions not greatly different.

Firing results will always show minor variations, but an average or standard is established to which all experiments approximate.

Pressure formulae derived on purely theoretical grounds have hitherto proved useless. They must be based upon firing experiments and must conform to known results.

Many variable factors affect rifle pressures, such as powder charge, size and weight of bullet, and so far as the barrel is concerned, by chambering, lead, and system of boring and rifling.

Certain formulae have been derived for calculating pressure, of which those by Sarrau and Charbonnier are considered, but neither gives entirely satisfactory results for rifle cartridges.

A formula will be given which is based upon experience covering 35 different types of rifle cartridges. The formula contains the usual pressure elements, the exponents of which are derived from experiments, and are near enough the correct values to give the pressure usually within 1-3 of a ton.

By discussion, the relation between the exponents of the variables is deduced, and based upon data published by Mr. Housman in 1902,

the numerical values of these exponents are calculated and tabulated, using Sarrau's formula to derive the relations, Charbonnier's formula being difficult to use in this manner.

#### —Arms—Rifle—Care of

[Directions for the Care and Preservation of Arms and Armament. By José L. Etchichury, Major, Argentine Army. *Revista Militar*, (Argentina), Jan, '16. 2000 words.]

It is well known that the government appropriates enormous sums to keep the army efficient; and not the least of the items of expense is that of maintaining the armament in serviceable condition. Here the zeal and patriotism of the officers are well shown. The enlisted men should also understand the great importance of this matter. The rifle is subject to deterioration through lack of care and badly applied methods. These faults must be remedied through the efforts of company, battalion, and regimental commanders. The soldier should know that only the approved methods and properly authorized cleaning materials are to be used. Instructions should be individual, practical and minute. Cleaning should take place at a designated hour, under the personal supervision of the officers and reliable non-commissioned officers. Without neglecting any part of the rifle, especial attention should be paid to the bore. Damage to the bore, frequently attributed to firing, is generally caused by the use of improper cleaning material and to incorrect methods. The regulations now prescribe a steel ramrod, with a false bolt to close the chamber. A hemp or other fibrous vegetable cleaner (or "pull-through") is better than a cloth, since the thickness of the cloth or tow prevents the cleaner from entering the grooves and removing the residue, while the fibres of the hemp accomplish this perfectly. The tendency of the soldier is to rub the cleaner back and forth rapidly in the bore. This, with a cloth "pull-through," damages the lands sensibly. With the hemp cleaner, this rapid rubbing is not only not necessary but a slow movement accomplishes the purpose better, in that it allows the fibres to enter the grooves. As for the other parts of the gun, oiling carefully done keeps them in condition.

Regulations require the careful handling of the rifle, and this applies as well to the execution of the manual of arms as to other occasions. The noise made by the so-called "smart handling" of the pieces is forbidden, as the constant shock diminishes measurably the life of the rifle. Particularly is this to be avoided in moving the piece from one hand to the other or in striking the ground. In the movement of "load" too much force is used in pulling back the bolt. This fault is particularly noticeable in rapid fire. More care must be taken in adjusting the sight, and in laying it down after firing or to change the method of fire.

(Numerous items of damage resulting from improper handling are mentioned.)

#### —Arms—Rifle—Sights

[The Battle Sight. By Capt. G. C. Lewis, 13th Infantry. *Infantry Jour.*, Nov, '15. 3500 words. Tables.]

The battle sight violates deep psychological principles; a frantic or scared man aims at the throat or head of his adversary; also is it intuitive blind impulse to shoot a missile up into the air to reach a distant enemy. The relative efficiency of the two sights, leaf and battle, is obscured by the fact that in Class F battle sight firing, aim is taken at a definite point,—the bottom of the target frame,—and also that the increase in the area of bull's-eye and outer is from 700 to 300 per cent over the fixed sight target.

The lesson of Pakenham's defeat at New Orleans by raw farmers and militia; of Santa Anna's tremendous loss of 1600 killed and 300 wounded, all shot in the head and shoulders by the 169 defenders of the Alamo; of the crushing repulse of British regular troops at the Tugela and Modder Rivers by Boer hunters, is that men who have once learned to shoot will shoot accurately in battle as long as they have a rifle to fire.

The adoption of the battle sight is based upon the following theoretical premises: that under excitement, leaf sights will not be set as commanded; that the battle sight is easily adjusted; and that it gives a full danger zone. Against it it is urged that with training in sight setting, men will always set their sights; that the normal tendency is to shoot high; that if men cannot set the regular leaf sight, they will also be too excited to aim at a tuft or other object a certain distance away from the object shot at; that the only effect is to cause men to aim inaccurately at the decisive ranges; and that the double system, leaf and battle, causes confusion. Tests made indicate the superiority of the leaf sight, the battle sight being much less accurate at critical ranges. There is no material difference where targets are not individually distinctive; where they are dispersed but individually distinctive, the leaf sight is superior.

Sight setting training is practical and worthy of the result to be gained. The present sight should be used only against cavalry charges or at the first instant of a surprise or ambushade. It is suggested that a 200 yard battle sight, to be used at all ranges under 500 yards, and when the men get out of hand, would be logical.

Two brigade commanders of the 2nd Division have recommended the abolition of the battle sight as a result of experimental firings and observation.

[How a Rifle is Sighted. *Scientific American*. Dec 11, '15. 2550 words.]

A discussion of the principles of sights on various rifles, of the different kinds of sights used, with great emphasis on the fact that the peep sight is the only rational and proper sight. Only two service rifles employ the peep sight, the American, and the Canadian. The latter is the one military rifle that correctly solves the sighting problem. The American rifle loses all of the virtues of the peep by the

**INFANTRY—Continued**

sight being set too far from the eye. A comparison of the German, British, and American sights is given. The American Springfield sight has grave errors, being neither a practical military sight nor an efficient target sight.

[Comments on the Battle Sight. By various officers as noted. Varied ground, p. 443-461. *Infantry Jour.*, Nov, 1915. 7800 words.]

(By Capt. H. P. Hobbs, Infy.)—Fire direction and fire control are more important than individual skill. Favors the battle sight, possibly set at 300 yards.

(By S. F.)—A universal sight would abolish the necessity for estimating ranges and setting sights, and would be a distinct advantage to such troops as will form our armies. Both sights have their proper place and use. The tangent sight, in general, can be used at a single target when range can be estimated, etc., as occasionally when on sentry or patrol duty, also at relatively long ranges to determine said range by observing the strike of the bullet. Collectively, it can be used in battle when the troops are under a light or ineffective fire or not under fire at all. It may occur even in battle that sights can be set at even 600 yards, though in attack these conditions would be abnormal. In defense, the use of the tangent sight is possible, especially in trench warfare.

The battle sight is for use against suddenly appearing targets; and under conditions where the volume of fire promises enough hits to warrant it. Also in emergencies when fire is opened in self defense at large targets.

Collectively, it should be used when fire direction and control are to an extent lost; when the men are out of hand; in night firing; against cavalry at any rapidly shifting range under 1000 yards; in a rencontre where the time element is a governing factor.

With the foregoing in mind, it is obvious that tests, to be conclusive or even contributory, must be conducted under conditions appropriate to the use of the sight in question. This principle was not always kept in view by Capt. Lewis. In the first table, the rate of fire is not appropriate either to the range or to the battle sight, and the fact that the tangent sight produced more hits is not therefore due to the difference in sights, but to the improper rate.

Did the "raw farmer" at New Orleans, the "backwoodsmen" at the Alamo, and the hunters at the Tugela use a tangent sight, adjusting the elevation as the enemy advanced, or did they—in backwoods terms, "jus' draw down on him"?

The tests of the sights by the school of musketry will be complete enough to settle this vexed question. Capt. Lewis' tests were admittedly not complete, and are therefore subject to allowances.

(By G. S. S.)—In his first paragraph, Capt. Lewis points out clearly the factors that should govern in the choice of sights. Many

officers have subscribed to his views in their official reports. Facts, not theories, must govern the adoption and the use of the proper sight. Psychology is a real factor and the impulse to aim at your enemy, not below or near him, is stronger than *training*, many times. The experiments are however not sufficiently extended to warrant the conclusions drawn. The tests are for the School of Musketry to make and in full. While a man can set his sights in 10 seconds with training, he can also fire say two to four aimed shots in that time. Capt. Lewis' article is really some evidence for a battle sight of 200 to 300 yards.

(By X. Y. Z.)—The battle sight should not be discarded, but should be so changed as to allow the marksman to aim directly at the objective. Confidence is an immense psychological factor which is destroyed by the element of chance introduced when firing with the point of aim away off from the intended point of strike. Can not a practical battle sight be made so as to use a fine sight at say 200, a half sight at 400, and a full sight at 600 yards? In all these cases, the effect is to lower the trajectory rather than to raise it over the target. The best sight is a white bead sight, the military black sight is only good against a white objective. The battle sight should not be scrapped yet, but improved and corrected to fill the useful office always open to it under certain conditions of field service.

(By Patrick J. Morrissey, Lt. Inf.)—It is not conclusively settled that the battle sight should be abolished. In all but a few cases, the use of one sight or the other is to be determined solely by one principle,—which sight will give the best results? The psychological factor is what brought about the introduction of the battle sight. Possibly the range is too long, and about 300 yards is believed to be right. This range is about the mean of the ranges of the principal foreign battle sights.

(By B. A. D.)—The time element decides which sight is to be used. The tangent sight may be used at short ranges. The battle sight should be retained, but the range should be reduced to 350 yards. This will give an ordinate of 10 inches, which recent wars have shown to be the height of target generally offered at close ranges.

(By G. Soulard Turner, Capt. Signal Corps. Table of tests.)—The article loses sight of the fact that the battle sight is for the purpose of eliminating range finding, and also sight setting. The average error in range finding is 12½%. This error plus normal error of leaf sight will at some ranges give a total greater than that caused by the trajectory of the battle sight. Also the correct distance to objective is not always the correct range to use. The collective effect of the battle sight has been ignored. It should have been considered. The range in Capt. Lewis' experiments 31 and 32 was in error by 36 yards. The experiments by not being conducted at greater ranges than 400 yards, omit an important factor and one favorable to the battle

sight. Had distances such as 385, 215 or 333 been chosen instead of distances so readily set off on the leaf, it would probably more nearly have approached battle conditions. The tests and arguments are not conclusive, it is believed. Even if they were, they would apply to the present battle sight, not to the battle sight in general.

(By Hugh A. Drum, Capt. 23d Inf.)—With fair accuracy in range estimation, the leaf is undoubtedly more accurate. Conditions however require the battle sight as being most efficient for the greatest number, all conditions being considered, lack of training, fear or other emotion, etc. The use of the battle sight is not obligatory, but is the problem of the commander. I believe in the present course of training, and suggest more training in the use of the battle sight. The impression that this sight must always be used inside of 500 yards should be corrected.

(By Capt. C. W. Weeks, 28th Infy.)—The use of the battle sight in battle tends to keep the dispersion of shots at a minimum. I see no reason to abolish the battle sight, but believe that a necessity exists for modifying it so as to increase the probability of hitting at 200 and 300 yards. The present sight causes too high a trajectory at these intermediate ranges.

(By Charles Miller, Major, 7th Infy.)—The article is not considered to have proved the contentions of the author. Our training should continue along present lines. It must not be held that our regulations forbid, in word or in spirit, the use of the fixed sight under all conditions over distances of less than 600 yards.

[Telescopic Rifle Sights for War. By Edward C. Crossman. *United Service Mag.*, Sept, '15. 1500 words.]

Some time ago, a British military shooting authority wrote, "The best of telescope sights is simply unthinkable in war." But sight makers in the United States are busy turning out telescopic sights to be paid for in pounds sterling.

The U. S. Government turned its attention to the development of a telescopic sight in 1908, and the result is the only strictly military telescope sight in the world, so far as the author knows.

The Germans had telescopic sights shortly after the war began, springing a surprise in this matter as in the 42 cm. mortars.

The Warner and Swazey and a Goertz branch make telescopic sights in the United States. They practically have the field to themselves, though the Winchester and Stevens Companies make telescope sights suitable for target work, with long tubes and complicated mechanism. The advantages of the telescope sight are that it acts like a field glass in picking up targets; it acts roughly as a rangefinder if provided with stadia marks; it magnifies and defines an object; it obviates the troublesome blur of metallic sights; and it allows good shooting in poor light. The disadvantages are that it magnifies the wab-

ble; it is difficult to mount on a bolt action rifle; it cannot be adjusted to a normal position of the eye; and it is expensive.

A good telescope sight must give good illumination, be of solid construction, have suitable and simple attachment to the rifle, and give long eye relief—(distance from eye to eye-piece in use). The six-power telescope is about the practical limit of magnifying power, but five-power is sufficient. The telescope sight for the new Springfield (U. S.) is a good glass, but of too high power for all-round work. The German telescope sights give a field of view as follows:—five-power, eleven per cent of the range; four-power, fifteen per cent; three-power, twenty per cent. The target telescopes give much smaller fields.

The rifle telescope is a low-power terrestrial. Unless the erection of image is done by prism construction, there is a considerable loss of light, hence the best telescope sights are prism type. The Zeiss is the best optically.

The American army telescopic sight is the only telescope rifle sight developed exclusively for military use. It has all the fine adjustments of a long range rifle sight. The cross-wires and stadia are etched on a glass placed in the focus of the lens. Both the objective and the eyepiece may be criticised as too small.

The original plan was to issue two telescopic sights to each infantry company for its best shots, or about 25 telescopic sights to a regiment. These sights cost \$41.25 each, and the rifle complete with mount and sight \$60.

There are certain objections to cross-wires; if fine enough not to blur on a poorly lighted object, they are hard to see, and break easily. The best form of sight is a flat steel post with a pointed top. In the best form, a horizontal wire is soldered a short distance below the sharp point.

For target shooting, the telescope sight is of no advantage except in a poor light. The principal advantage is with a dimly visible target, upon which it may be impossible to aim with metallic sights. The telescopic sight will pick up at a thousand yards a target that may fool the naked eye at two hundred.

The telescopic mounting is subject to severe strains in firing. The sight weighs a pound or more, and the recoil reaches almost instantly a velocity of 15 f.s., hence the sight is heavily jarred at each discharge. The Germans use a machine which duplicates this jar for testing their telescopic sights.

The German sight is strong, but lacks lateral adjustment. This would put its user at a disadvantage in a duel with an American sight at 1000 yards. But the German sight is good enough for what is required of it.

[Collective Effect of the Battle Sight. By Capt. G. Soulard Turner, Signal Corps (Infantry). *Infantry Jour.*, Dec, '15. 2300 words, tables, diagram.]

The present battle sight is not perfect, and discussion leading to its improvement should be encouraged. Such discussion must be based

**INFANTRY—Continued**

upon a thorough understanding of the powers and limitations of the battle sight. Its use is for collective effect, and to condemn it because it does not at each range shoot where held is to not understand or to ignore its functions. By a great number of experimental firings, it has been found that the average battle sight range is 436 yards, not 547 yards as generally stated. The summit of the trajectory is at a point 233 yards from the muzzle. The study of a great number of tests made in collective firing shows the battle sight to be slightly superior. The principles by which the data are computed will be found in Eames' "Rifle in War." Other factors tend to reduce this percentage in favor of the battle sight. The leaf sight will give more ricochets; battle targets will not be so high off the ground as the F target, upon which the tests have been made; the percentage is based on area, and does not consider the fact that the target is much smaller at the top.

Range does not affect the battle sight,—and does directly affect the leaf sight. The results stated are sufficiently exact to prove that the sights are approximately equally effective in the battle sight zone. It is further believed that condemnation of the battle sight on account of its variable aiming point does not stand analysis when the important collective effect is considered.

**—Arms—Rifle—Vibration of Barrel**

[The Vibrations of Rifle Barrels. By J. de Lossada, 1st Lt. of Art. *Mem. de Artilleria*, (Spain), Feb, '16. 1500 words.]

In a memorial presented to the Institution of Civil Engineers in 1913, the following conclusions were drawn as the result of experiments:

1. The form of the exterior of the barrel affects the vibrations notably.
2. The vibrations vary in a marked manner with the variation in the twist of the rifling.
3. The method of support greatly affects the fire, the most accurate fire corresponding to the most rigid support.
4. Variations in the muzzle velocity caused slight changes in the general characteristics of the curve of vibrations of each gun.

**—Attack**

[Methods of Attack of the German Infantry. From trustworthy data received from the western front. *La Guerra y su Preparación*. (Spain), Sept, '16. 800 words.]

In the operations before Verdun between Feb 21 and Apr 15, the German Army Corps nearly always attacked with their divisions side by side. Only in exceptional cases, as when the extent or importance of the zone assigned to a single corps permitted only the employment of a single division, did the other remain behind in support of the first.

**Zone of Action and Disposition of the Division**

The front of the zone assigned to a division of three regiments (7200 rifles) varies

between 1000 and 2500 meters, according to the importance and number of the successive objectives assigned to it.

In respect of the disposition for attack of its units, if the zone of action be narrow and the objective varied, the division places two regiments in the first line, side by side, with the third in reserve. But if the zone be wide, with only one objective, then the three regiments form in one line, separated by intervals varying with the nature of the ground.

**Formation of the Regiment for the Attack**

Whatever be the disposition taken by the division, the regiments place in general one battalion in the first line and keep two in reserve, echeloned in depth at distances depending on the nature of the ground. The more advanced of the two reserve battalions is always in readiness to advance, either to support the attack against the first objective, or to carry it on beyond. The other reserve battalion is at ease; its duty is, at the right moment, to relieve the exhausted units of the first line.

**Formations of the Battalion for the Assault**

The German Infantry in general turns out its battalions in two lines. The first is almost invariably composed of two companies side by side; these deploy for the assault either in the most advanced trench or in the last shelter. The second line remains in the supporting trenches, either in shelters or under some covering obstacle.

The procedure of attack is always that of successive lines of men, and rests upon the following general principles:

1° To each line of attack is always assigned a limited and well-defined objective, no wider than the front of attack, and never deeper than the distance between two successive lines of trenches.

2° The assaults open only after the artillery has thoroughly swept the trenches and destroyed the obstacles, in order to compel the adoption of the scheme would have resulted in every Indian infantry battalion being able to take the field at once at full strength with a full reserve of all ranks. The reserve of officers was to be provided by restricted defense to abandon all idea of resistance.

3° The assault proper is preceded by thorough reconnaissance of the objective sought, in order to make sure that the artillery has produced the desired effect. These reconnaissances in reality constitute the first wave of the assault; the succeeding waves are held back until the first shall have made progress.

In respect of details, the various methods of assault so far observed are more or less of the following pattern: the successive waves are three, separated by some 20 or 30 paces. The first of these makes the reconnaissance mentioned above; it is formed by one or two squads from each platoon, is accompanied by scouts carrying tools, and by grenadiers, and is deployed at wide intervals. The second wave consists of a dense line of rifles, and comprises the principal part of each platoon. This line's duty is to occupy the trenches.

Finally, the third is composed of the remainders of each platoon, and constitutes a new echelon, whose business it is to fill the gaps that may be produced. With it goes a reserve of munitions and materials (e.g., tools and sandbags) in order to hold the captured trenches.

#### *Mission of the Second Line of Attack.*

As a matter of principle, this line is reserved for a second assault carried beyond the objective reached by the first line. Under exceptional circumstances it is used to re-enforce the first line or to reform it in case it is smashed.

The assaulting waves always take deployed formations. Prisoners, when questioned, are unanimous in declaring that they have never seen columns used in assault. Doubtless, attacking waves in dense lines have left behind a great number of stragglers, and thus given the impression of small columns of assault formed up behind the lines.

See also

#### ATTACK

#### ATTACK—COMBINED ARMS

#### EUROPEAN WAR—MILITARY LESSONS OF THE

(Article: "Military and Naval Notes Abroad")

(Article: "War Notes." Sept, '15.)

#### —Attack—Frontal

See

#### ATTACK—FRONTAL

#### —Attack—Under Artillery Fire

[The Limits of the Physical Effects of Artillery Fire Over Troops. By Jv. *Svensk Artilleritidskrift*, 2nd No., 1915. 1140 words.]

It has generally been considered that an artillery projectile should pass eight or ten yards over a body of men in order that they should not be subjected to danger, but as several instances occurred during the Russo-Japanese war in which projectiles passed very close over men without doing them any damage, the Russian school of fire for Field Artillery took occasion to study this question and determine practically how great this so-called "physical safety-distance" is.

The report from this school of fire for 1914 describes the experiments and the conclusions derived from them, but unfortunately only for the 7.5 cm. (2.95 in) rapid fire field gun, as this was the only gun experimented with.

The method of conducting these experiments is fully described and how the projectile was made to pass closer and closer to certain objects and the effects noted. These objects were fine sand, surface of water, thin writing paper stretched in a frame parallel to the path of the projectile and finally two chickens and two rabbits in cages. The first real effects, such as the tearing of the thin writing paper, throwing up of some of the water, and the effects of the blast of the projectile on the fine sand were seen when the distance to the path of the projectile was about 4 inches.

There seemed to be no physical effects on the animals unless the projectile actually touched them; they were not even disturbed when the projectile passed close above their backs. It was however, as a matter of safety,

proposed to take as the "medicinal safety-distance" the distance at which the first slight mechanical effects of a passing projectile were observed, namely 27½ inches, instead of the eight or ten yards, as heretofore. This however only holds true for guns of 2.95 in. cal. or less and with a velocity of projectile of 1937 f.s. For larger calibers additional experiments must be made to determine it.

Hence, as support for one's own infantry during an attack (on level ground), artillery can fire over its own troops up to the time they are within 175 yards of the point fired at.

[Shrapnel and Infantry Formations. By Col. L. W. V. Kennon, 25th Infantry. *Infantry Jour.*, Dec, '15. 5500 words, diagrams.]

Co-operation between infantry and artillery must be perfect to guarantee success. The close union requires that each arm study the functions and capabilities of the other, and that they understand how to work together for the accomplishment of a common end.

(The nature and effect of present day artillery fire being fully given in the opening pages of the original article, the methods by which infantry may advance when exposed to it are set forth.)

The cone of dispersion demands our attention at first, since the projectiles forming it are an effective instrument of field artillery against infantry. In the German 3-inch field gun, the effective depth of the beaten zone of one cone of dispersion at 2500 meters range is 245 yards, with a width of 30 yards. At 5000 meters, the depth is 75 yards and width about 20 yards. The greatest density of pattern is in the part of the ellipse nearest the burst, and is about 30 yards in depth. At 2500 meters there are about 1.28 bullets per square yard, and at 5000 meters, about 1.0 per square yard. At about 300 yards from the point of burst, shrapnel bullets become ineffective.

A battery of six guns is expected to have destructive effect on 150 yards of front at the target.

The influence of the character of the terrain is noted and illustrated by a sketch in the original article. To protect infantry nowadays, slopes must be sufficiently steep of themselves; slight folds are now exposed to aeroplane reconnaissance.

Shrapnel fire is destructive under favorable conditions, but not annihilating as claimed. In fact, it has been rather insignificant in recent wars. Infantry will always be exposed to it, and must make headway against it. The price paid is the cost of victory, and our study is how to reduce the price, as there can be no victory without the infantry advance.

Let us assume open country, the most favorable for artillery. The enemy is in position.

From 6000 to 4500 yards, the effect of well directed shrapnel is comparatively slight. Columns of regiments or battalions may be employed, or at need line of companies in column of squads. The most effective ranges for artillery are under 3500 yards, where special protective formations are required. Bear in mind that the aim is to form an infantry

**INFANTRY—Continued**

firing line within effective range of the hostile infantry. This line must be sufficiently strong to open fire, and must be under its proper leaders. A skirmish line is easily located and is very vulnerable, and in general is a weak formation except for its sole purpose of developing fire action. Close order formations are equally unsuitable. A line of squad columns is about as vulnerable as the line of skirmishers, but it is less conspicuous and at times even very difficult to locate. The foreign method is to advance by small columns, generally platoons well closed up, with intervals of 50 yards. Linear formations are avoided, since the regularity favors discovery and location by the artillery. Irregular echelons and oblique marching will confuse observers in locating bursts. Only one platoon is in the zone of dispersion of one shrapnel with this interval. Under conditions not so absolutely favorable to artillery, the effect of artillery fire falls off considerably, and well authenticated instances show absolute immunity at ranges from 3500 to 2500 yards.

The distance between units should be not less than 250 yards, and the interval not less than 30 yards. These are the minima.

The method of advance indicated has the following advantages: the units are difficult to locate; the men are under control; the advance is comparatively rapid; and a relatively strong firing line is established by the arrival of the first unit on the firing line. This method is about 20 minutes quicker than for the advance of thin lines from about 3500 to 800 yards. There is, however, greater liability of loss. Staggered lines of squad columns are less vulnerable than a line of squad columns. The men are under slightly better control, and less time is required. With respect to platoon columns, the staggered line of squad columns is less vulnerable, requires about the same time for deployment, but sacrifices control.

Passes, crests, sunken roads, edges of woods, —in fact all points of a hostile front exposed to the view of the enemy, are to be crossed at a run. The march should be continued until the bursts are close. An "over" or just "short" calls for a rapid movement forward or to the side. A burst considerably "short" requires cover to be taken. If there is no cover, the men should lie down. The pack affords considerable protection. Disappearance baffles the enemy. Terrain sloping to the front diminishes the area of the beaten zone and the effect of ricochets. When under effective infantry and artillery fire, the advance must be made even by individuals, since superiority of fire is now the prime necessity. With cover available, reserves should be kept in close order, otherwise the same formations as the advance should be adopted.

The effects of howitzer fire are similar. The beaten zone is less deep, but wider and with greater density. The same methods of advance should be used, but the interval must be at least 50 yards.

The infantryman's task is harder, but not impossible. Protective measures must not in-

terfere with aggressive action, for the enemy is still the objective which must be reached.

**—Drill Regulations**

[Deploying Intervals. 1st Lieut. J. Anganuzzi. *Rev. del Circulo Militar*, Sept, '16. 1000 words.]

(Concerning a question of interpretation of local drill regulations.)

**—Equipment—Pack**

[Why Not the Tump Line? By H. W. Congdon, Capt. 23d Inf., N. G. N. Y. *Infantry Jour.*, Nov, '15. 600 words.]

The 1910 pack is a most comfortable military pack, but the weariness in the shoulders could be avoided could the weight have been shifted to the neck by a tump line attachment. This tump line passes over the shoulders and becomes a broad, soft strap around the forehead. It allows greater distance with less fatigue. Indians are said to carry 200 pounds twenty miles a day. This addition to the 1910 pack will not adversely affect it, but will afford several advantages. Has it ever been considered in planning our infantry equipment?

**—Fire**

See also

**BALLISTICS****—Fire—Anti-aircraft**

[Small Arms Fire Against Airships with Rifles, Automatic and Machine Guns. By Capt. V. Bisgaard and 1st Lieut. C. Raaby. *Dansk Artilleri Tidsskrift*, Jan, '16. 8000 words, 15 diagrams.]

Airships that come within range of small arms fire may be considered under the following two classes:

- (a) Lighter than air (dirigibles);
- (b) Heavier than air (aeroplanes).

Captive and drift balloons will hardly ever come within range of small arms.

**(a) Lighter than air.**

*Size.* Generally the length, height and width will be about 100, 20 and 12 meters, respectively.

*Speed.* Varies at the present time between 40 and 80 km. per hour, or 11 to 22 m. per second.

*Vulnerability,* to ordinary small arms fire slight. Numerous hits must be made in the envelope to cause a noticeable loss of gas in a short time. The car (gondola) will often be armored.

*Height of flight* will generally be more than 1000 meters, say 1500 meters.

**(b) Heavier than air.**

*Size.* Length of wings 8 to 17 meters; fore and aft length, 5 to 12 meters; height, 3 to 4 meters.

*Speed* is very variable, from 70 to 180 km. per hour, or about 20 to 50 m. per second. The usual speed for military planes may be taken as fully 100 km. per hour, or about 30 m. per second.

*Vulnerability* is extremely slight. Hits in the planes seem to have no effect. Only hits of crew or vital parts such as the motors or propeller are fatal. These



targets will generally be protected by armor.

*Height of flight* for reconnaissance under normal atmospheric conditions will generally be about 800 to 1000 meters.

It is generally conceded that dirigibles should be fired upon with small arms when operating at altitudes below 1000 meters. Even if immediate results cannot be expected, the chance for many hits is good. Numerous holes in the gas bags may prevent the dirigible from reaching its hangar, in which case it is generally lost.

The efficacy of small arms fire against aeroplanes is doubtful. *Militär Wochenblatt* gives the following reasons against the practice:

(1) Difficulty of distinguishing between friendly and enemy fliers.

(2) Danger of hitting friendly troops.

(3) The small chance of hitting a small and swift target.

(4) The firing will disclose the positions of the troops and aid an enemy flier to solve his problem.

#### —Fire—Ballistics

[The Calculation of Rifle Pressure. By F. W. Jones. *Arms and Explosives*, Jan, '16. 2800 words. Tables, formulae and diagram. Continued from Dec number.]

From evidence given in the previous communication, it is seen that a rifle pressure formula on the lines of Sarrau will not give accurate results at all levels of pressure, because the correct exponents of the pressure elements are not constant. However, since there is a rule for finding the charge for any pressure when the pressure for any one charge is known, we may assume a pressure for the moment and seek the corresponding charge. Hence the devising of a pressure formula to work at one level of pressure is a practical proposition.

In order that the pressure curves derived from experiments with different cartridges might be compared on a common basis, it was necessary that a sort of common denominator be given them. The pressures were plotted out against the powder charges and the best curve drawn through their points. Then the charge on the curve corresponding to 20 tons pressure was read off and given a value of 100, and all other charges were given a figure value in proportion. For example, if the charge corresponding to 20 tons pressure on the curve was found to be 87 grains, the proportional value of a charge of 70 grains was taken as  $70/87$  of 100, or 80.4. By this method of making pressure curves, the common denominator was provided by reducing all charges to a basis where the load giving 20 tons pressure equalled 100.

All available pressure records having been plotted on a diagram, it was seen that the records for all the different cartridges and powders had a general disposition, and that a curve representing average behavior might therefore be readily drawn. The curve was a branch of a hyperbola.

The equation of the curve is given and by

means of it is deduced a table of pressures and proportionate charges. This table affords a means for finding the charges that would give 20 tons pressure. Then standard pressures may be replaced by 20-ton charges, and a formula on the lines of Sarrau is written, containing three unknowns. If two of these are assumed or given, the third may be investigated by plotting.

In this formula there is a constant (K), and since in searching for an empirical pressure formula this constant must be kept invariable, the records from one kind of powder must be used. The work entails considerable arithmetic, because the operations consist in finding by trial and error the mathematical expression that most accurately reproduces actual results. The operation is never complete because there is no indication that the solution adopted is the best that can be found. In the end simplicity of form and the necessity of placing some limit on the time spent on the work, bring the research to an end.

For rifle cordite the formula adopted for calculating the charge that will give 20 tons pressure is

$$C_0 = 26.2d \left[ \frac{B^2}{W(1 + 0.2d^{-1})} \right]^{1/4}$$

in which:

$C_0$  = 20 tons pressure charge;

$B$  = Volume of powder chamber, (weight of water in grains which would fill the powder chamber of fired cartridge case);

$W$  = Weight of bullet in grains;

$d$  = Diameter in inches of a circle related to the sectional area of the bore taking the rifling grooves into account.

To make this formula applicable to a powder other than rifle cordite, it is only necessary to alter the constant multiple 26.2. For example, a powder which was shown by experiment to require 1.07 times the weight of rifle cordite to develop the same pressure would necessitate a change of the constant multiple from 26.2 to  $26.2 \times 1.07$ , or 28.

To calculate the pressure of a given charge ( $C$ ), the charge giving 20 tons pressure ( $C_0$ ) is obtained from the above formula and given its common denominator value 100. The proportionate charge is then found from the rule

of three,  $100 \times \frac{C}{C_0}$  and from the table of

pressure and proportionate charges before mentioned, the pressure equivalent to this proportionate charge is ascertained.

The accuracy of this method is shown by the fact that it has in most cases given pressures within 0.34 ton of the actual ones.

The formula has also been transformed to give an equation by the use of which the change of pressure due to a variation in the weight of bullet or the volume of the powder chamber can be estimated approximately and rapidly.

[Negative Angle Wanderings. *Arms and Explosives*, Feb, '16. 2800 words.]

## INFANTRY—Continued

Negative angle shooting was first introduced to the world about four years ago as a sure means of eliminating the effects of bullet drop. There was in the beginning, and has been ever since, a certain haziness in respect of the system, due to the lack of clarity of diction in the pamphlets circulated for the purpose of explaining it, and also in the patent claim. As we originally understood it, however, negative angle shooting consisted in aiming the height of the target below the bottom edge of the target, the elevation given to the sights being such as to ensure making a hit over the greatest possible extent of range. It gave an elevation to the sights above that required for a selected medium range and that surplus was corrected by aiming the height of the target below the target. The advantage claimed consisted in the fact that compensation is provided in the sense that aiming a set amount below an object makes a greater angular correction at near ranges than at distant ones. Thus is cancelled a part of the error due to the high line of fire normally existing at near ranges when the elevation given suits a more distant range.

The system reaches its limit at the range determined by the heights of the target and the trajectory of the bullet. The first set of figures had reference to the .303 blunt nose Mark VI service bullet, and a 5 ft. 6 in. height of target imposed a limit range of about 630 yards. Even in respect of the ranges included in this limited zone of effectiveness, several arguments were advanced against the system. In the first place, a human target 5 ft. 6 in. in height is not a typical mark on a modern battlefield. Further, taking aim a set distance below the visible object does not seem a less difficult task than aiming direct with sights set for the estimated distance or aiming above or below to allow for the deviation of range from that for which the sights are at the moment set.

The fact that the target in battle would more often be a man in the prone position than in the upright was met by the adoption of an alternative range setting. The same procedure was followed, but the range of effectiveness of the system was reduced. Furthermore there still remained the objection that the man in the prone position, as in the upright, would take all possible advantage of cover, screening the lower part of his body and thus making the exact location of the necessary gauging index hard to determine.

When the Mark VII pointed service bullet was substituted for the blunt nose pattern, it might have been expected that the increased flatness of trajectory would extend considerably the range of effectiveness of the negative angle system. Instead of this the advantages introduced by the new bullet seem to have been utilized mainly to make a nearer approach to ordinary conditions of shooting.

Absolute precision of statement in this connection is rendered difficult by the lack of clear exposition of the system, but its curious extension so as to make it embrace well-known

methods of sighting and aiming rifles is exemplified in a pamphlet circulated for the purpose of explaining it and in a recent contribution to the columns of our American contemporary, *Arms and the Man*. This contribution was by Mr. E. J. D. Newitt, one of the co-inventors, who is at present in the United States.

Negative angle sighting has had a good run for the large sums of money which have time, four years after its introduction, converts to the system are not in evidence in been devoted to booming it, but at the present large numbers.

[The Calculation of Rifle Velocities. By F. W. Jones. *Arms and Explosives*, Feb, '16. 1400 words.]

The formula published by the writer in 1904 for the calculation of rifle velocities was as follows:

$$V = 2380 P^{.45} \sqrt{\frac{C}{W + 400d}} \dots\dots\dots (1)$$

The symbols used in this article have the following significance:

$W$  = Weight of bullet in grains.

$d$  = Diameter in inches of a circle related to the sectional area of the bore taking the rifling grooves into account.

$l$  = Length of barrel in inches, as measured from the breech face to the muzzle.

$P$  = Pressure in tons per square inch.

$C$  = Charge of powder in grains.

$V$  = Velocity at the muzzle in feet per second given by the charge  $C$ .

$C_0$  = Charge of powder in grains giving 20 tons pressure.

$V_0$  = Velocity at the muzzle in feet per second given by the charge  $C_0$ .

The formula (1) is for the calculation of velocities of standard cordite cartridges in 30 inch barrels, and it is now proposed to modify it to make it applicable to rifle barrels of any length and suitable for powder charges other than those adopted as standard.

As explained in the last issue of *Arms and Explosives*, the weight  $W(1 + 0.2d^{-1})$  grains best takes account of the friction in the bore. Substituting it for the old expression  $(W + 400d)$  grains, and correcting for 20 tons level of pressure, the formula (1) is written:

$$V_0 = 7210 \sqrt{\frac{C_0}{W(1 + 0.2d^{-1})}} \dots\dots\dots (2)$$

In the author's 1904 article it was stated as a result of observation that in a given bore the velocity was directly proportional to the charge, that is to say, for the same cartridge,

$$\frac{V}{C} = \frac{V_0}{C_0} \text{ or } V = V_0 \frac{C}{C_0} \dots\dots\dots (3)$$

Expression (2) applies to 30" barrels, rifle cordite powder and 20 tons pressure charges, the latter being calculated by the pressure formulae, as explained in the Pressure Calculations article. It will readily be seen that by means of (3) the velocity of any charge

may be estimated from the calculated values of the 20 tons charges, so that (2) provides a means for calculating the velocity of any and all charges of rifle cordite in 30" barrels.

To make the expression applicable for all barrel lengths a factor  $L^{.2}$  is introduced. This value of the barrel's length element was adopted after a number of experiments had been made and all evidence carefully considered. To introduce it into the equation (2), which is for barrel lengths of 30", it is only necessary to multiply by

$$\frac{L^{0.2}}{30^{0.2}} \text{ or } \frac{L^{0.2}}{1.974} \text{ which gives}$$

$$V_0 = 3650 L^{0.2} \sqrt{\frac{C_0}{W(1+0.2d^{1.1})}} \dots \dots \dots (4)$$

The formulae (3) and (4), with the pressure formulae given in last month's issue, provide a means for calculating rifle pressures and velocities for rifle cordite. The combination has been thoroughly tested and has given satisfactory results.

The formula (4) can be made to apply to a powder other than rifle cordite by the proper change in the constant 3650. For example to make it suitable for a powder which, under test, when giving the same pressure as rifle cordite, has a charge 1.07 times greater than the cordite and gives a velocity 1.02 times greater, the constant 3650 must be multiplied

$$\text{by } \frac{1.02}{\sqrt{1.07}}$$

For taking account of the effect of the temperature of the powder at the moment of ignition, the best rule, adopted after much experimenting, is that a rise of 20° F. will cause an increase of one ton in pressure and an addition of about 35 f.s. in velocity. This rule is for rifle cordite. Most powders are believed to be somewhat less affected by temperature.

#### —Fire—In European War

[Infantry Fire in the Present War. By General Cherfille, French Army. *Infantry Jour.*, Nov, '15. 1000 words.]

The "fire to conquer" lies between the two schools of "fire to kill," that of precision; and "rapid fire," which, carried to the extreme, results in the heresy of "fire to create fear."

The infantryman was formerly thought to be the accessory of the cannon, and to prolong the zone fire of the latter; but the present war has cruelly shown that there is a zone between the artillery preparation and the bayonet charge where the infantry should be supreme if it knows how to deliver a fire that kills.

Modern fire is based upon *to will, to be able, and to know*. This latter necessary factor is bringing home to us the principle that an accurate weapon should insure an accurate fire in this intermediate zone.

The complete weapon is the rifle with the bayonet, but the bayonet is only added to the rifle as the shock follows fire, the latter preparing for the former.

#### —Fire—Instruction and Training

[Practical Rifle Shooting. By Edward C. Crossman. *United Service Mag.*, Aug, '15. 4500 words.]

The great mass of American rifle users are trained to the use of the standing off-hand position, the position of the sportsman. Prone firing is more accurate, but off-hand firing requires that the shot must go the instant the rifle is pointed right, without loss of time. Few military shots can do this, because they are not trained to do it. There is some excuse in the fact that it is difficult to get the recruit to hit the mark at all, without introducing the element of speed. Military rifle training is faulty in that speed is not insisted on after control of the rifle is gained. Surprise fire, an American method used in some of the matches in 1912, brought out the possibilities of speed and accuracy in firing from any position. Intended for off-hand firing, it was shown that a man standing could take the prone position and hit a target visible for only four seconds. Good scores were also made off-hand, but "possibles" were made quite regularly from the prone position, showing that practically snap shooting was possible from that position. Men should be taught both speed and accuracy from the start.

Plain and large objectives should be used in practice. When quick and accurate shooting is imperative, as when a charge is nearing home, the targets are plain and large. Teach a man to shoot quickly when his aim is right, and not to fire till he sees something and aims at it, and a rifleman has been produced. Against such riflemen, no charge could ever get home, and the bayonet would become a useless weight.

[Rifle Practice and the Nation. *Arms and the Man*, Feb 17, '16. Quoted in full.]

One of the most important provisions of the proposed National Guard bill is that which relates to the promotion of rifle practice. It establishes, in a few brief sentences, means for securing outdoor ranges, the crying need of the hour. The Secretary of War is required to prepare a comprehensive plan for securing both indoor and outdoor ranges throughout the country, and to estimate to Congress each year for appropriations to carry out the year's building program. In much the same way the system of coast defenses was established. Rifle ranges to permit the soldiery and the citizens to train are just as important a part of the national defense as are the expensive and elaborate permanent fortifications that guard the great harbors. Relatively speaking, the cost of ranges is exceedingly small, measured in returns in defense.

Intensive training in rifle fire on the part of the military forces, the training of the cadets of the Junior Guard, and the training of citizens all are provided for in the scheme presented. Properly administered, assuming even a fair degree of liberality on the part of Congress in appropriations, the plan should

**INFANTRY—Continued**

restore the country's old-time prestige as a nation of riflemen.

[Infantry Combat Firing. By Major Toledo (continuation). *Revista Militar*, July, 1916. 1800 words.]

The section being the fire unit in combat, the manner in which the section commander controls the sheaf of fire by means of his orders and dispositions is most important. He should never know in advance the correct range but should always be required to estimate or otherwise determine it. The time of receipt and sending of orders and messages should be noted; also when fire begins and ceases. It is interesting to observe that fresh troops can deliver a more effective fire at a range of 500 meters than they can at shorter ranges when exhausted by rushes to the front. In calculating the results of firing exercises the following should be considered:

1. Number and kind of targets.
2. Intervals between targets.
3. The range.
4. The advances.
5. Errors in estimating the range.
6. Atmospheric conditions.
7. Number of rounds fired.
8. Duration of fire.
9. Velocity of fire.
10. Number of men firing.
11. Number of hits.
12. Number of figures struck.

(Two of General Rohne's tables follow.)

[Three Views on the Small Bore and Its Possibilities. No. 1—A Miniature Service Rifle. By E. Newitt. *Arms and the Man*, Oct 5, '16. 1000 words.]

An idea prevails in this country that the man who can reel off a string of bull's-eyes at known distances is an ideal military shot. As a matter of fact, such a man has only passed through the rudimentary phase of war training.

It is a curious fact that in war fire effect is dependent not so much upon the individual skill of the firer as upon the ability of the fire-control officer to direct a spray of bullets when and where it is needed. The greater part of the actual shooter's training should be directed toward enabling him to comprehend instantly the nature and position of an object indicated by the fire-control officer; to load, adjust sights, and fire rapidly without too great dispersion, and to start and stop instantly when told.

Probably the chief reason why such an infinitesimal portion of the rifleman's time is given to this secondary phase of shooting instruction is found in the difficulty caused by the energy and range of the military rifle and the expense of its ammunition. Collective field firing with military rifles can be conducted only on large, isolated tracts of land, such as are seldom found near regimental posts. On the other hand, very useful field firing could be conducted with .22 caliber rifles on much smaller fields. The extreme

range of the .22 is only 1350 yards, as compared with the 4000 yards of the service cartridge. Its initial energy is only 89 foot pounds, as against the foot ton of the larger cartridge, so that little is required to stop it.

The present .22 cartridge does not lend itself favorably to clip-loading and rapid magazine fire in conjunction with any of the bolt action mechanisms; but it is possible to produce a cheap low-power miniature cartridge having sufficient accuracy up to 500 yards, which would feed through a box magazine and would be clip-loaded. Such a cartridge would be well adapted to field firing over the greater part of the distance at which rifle fire is profitable in war, and could be safely used in a great number of places where such firing with a military cartridge would be impracticable.

It is in this field-firing instruction that a service rifle using a miniature cartridge would find its most useful application, and it is well worth the cost of the necessary experiments to produce an improved .22 cartridge and a service-type rifle to shoot it.

**Argentina**

[Combat Firing in the Infantry. By Major Felix M. Toledo. *Revista Militar* (Argentina), June, '16. 1900 words.]

(Combat firing problems are discussed under the captions: "Method of Arranging the Exercises," "Valuation and Criticism," "Practical Formulas and Tables which Should be Known in Order to Make a Good Critique." General von Rohne's book on Infantry Combat Firing (edition of 1895) is frequently referred to. The tables and formulas given are from this work.)

**—Fire—Instruction and Training—Musketry**

[Field Firing. By Major Palmer E. Pierce, 15th Inf. *Infantry Jour.*, Nov, '15. Sketch. 3000 words.]

In spite of the fact that many are of the opinion that interest in target practice is less than formerly, the following points must be noted:

1. A greater number of men draw increased pay for excellence in shooting.
2. There is a full attendance at schools of musketry on the part of officers.
3. A school of musketry for field officers of infantry and cavalry has been established.

This is tending toward higher things than individual workmanship; it leads to fire leadership, fire control, and fire direction.

Data collected during the Russo-Japanese War, where 85 per cent of casualties resulted from small-arms fire, are being verified to-day in Europe. Infantry, as General French has recently said, "is still the Queen of Battles." Now, infantry is not good unless it can shoot well. The true test is the number of hits under given conditions.

These conditions in our present field firing are such that a judgment as to whether a company is proficient or not, is very difficult to make. Collective firing is too complex an operation to have its results expressed by a number. Examples beyond the one mentioned

in the text can be shown where a just decision is almost impossible, due to the various factors entering into the problem. An error in range by a newly joined officer may invalidate the excellent individual fire of the soldier.

One of the great benefits to be derived from the new school of fire for field officers will be the training to common standards. An indirect result will be a new dignity for the infantry and cavalry based upon the appreciation by the other branches of the fact that the infantry and cavalry have technical problems whose successful solutions depend on professional attainments of high order.

[The Importance of Musketry Training. By Major Vaukoff, Bulgarian Army. Translated by 1st Lt. Sherman Miles, F. A. *Infantry Jour.*, Dec, '15. 7400 words.]

In our late war, the tremendous significance of marksmanship as a determining factor in the successful issue of battle was impressed upon us, also our own deficiency. Musketry training must be given in time of peace. The well trained rifleman must know how to hit his objective, when and upon what objects to fire, how to utilize the folds of the ground, and he should be able to execute his orders and instructions for firing in due time. Officers require training in fire direction and fire control.

The object of fire is to facilitate our maneuvers, to disorganize the enemy, both morally and physically, so as to destroy his resistance. Surprise fire, and especially on a flank, lowers the morale of an enemy and produces confusion in proportion to its intensity. If well executed, an enemy cannot recuperate. This subject should receive the special attention of commanders.

When its advantages are evident, concentration and rapid opening of fire produces great effect. Concentration should be upon a line of not more than one-half the firing front. Continuance of this fire depends upon the effect produced. Mutual support of neighboring groups by fire is as important as mutual tactical support. If the source of a fire opposing the advance of one of our groups can be located, it must be fired upon by the adjoining groups. A closer fire connection would have saved several lost battles in the last war.

Rapidity of fire should depend on the range, the size of and the danger from the target. At long range against artillery or cavalry passing a small opening, fire should be delivered with the greatest possible rapidity. A charge of infantry or cavalry should be met with the maximum rapidity of fire,—10 rounds per minute. Against separate groups at short and medium ranges, the rate should be 5 or 6 per minute, since precision is necessary. The supply of ammunition determines the rapidity of fire and in reality, the rapidity of fire is fixed by the rifleman himself. Train him to judge properly for himself. From 1200 yards in, the officer's influence over fire completely disappears. He can only try to harmonize the fire support of his group.

Volley firing produces great moral effect. It quiets the men, locates targets, and is especially valuable at night, against cavalry, and in the first stages of a pursuit.

The advance by the enemy in small groups should be opposed by the fire of selected good marksmen. Flank fire by adjacent groups is to be delivered if possible.

Good observation is required to select targets. In any case, the point of attack chosen should be the target. Fire must not be opened until the location of target and its range have been determined. To fire without seeing the target is rare, although fire upon certain points to keep the enemy down, or to prevent his crossing, shows the fullest comprehension of fire tactics. Fire upon an invisible enemy concealed in a field, orchard, etc., not over 200-300 paces deep, will give satisfactory results, since normal dispersion of bullets is about 200-300 paces.

Small targets and quick movements are the secret of advancing at short ranges. Fire cannot be concentrated against such groups nor can they be surprised. Follow up closely the movements of an enemy by designating parts of each platoon to observe separate groups and to prevent their advance by the delivery of an accurate fire.

Success without fire supremacy is unthinkable. It paves the way for an advance and causes the enemy to shirk the bayonet shock. In general, supremacy cannot be obtained at long ranges, therefore advance quickly in small groups. So long as the fire is weak, advance compactly, deploy only when necessary to open fire. If fire superiority be not gained, take steps to protect the men from long exposure to the enemy's fire. Machine guns, by their mechanical fire, steady the defense and force the enemy down. Artillery aid should be requested if necessary. The first moment in the struggle for fire supremacy is the important one, since it exerts great influence on the subsequent course of the combat. Once gained, it can be gained a second time much more rapidly and with much less hostile resistance. Fire superiority causes even greater moral than physical losses. It takes high morale not to abandon a position at short range after the enemy has won fire superiority. Concentration of fire is a valuable aid. Do not continue an ineffective fire. A cessation of hostile fire does not mean his domination by our fire. The abandonment of a position under long range artillery fire, at Baliona, shows the necessity of morale and musketry training.

Fire discipline must be rigidly enforced. It is most important at night. Lack of fire discipline compromised many attacks in the late war. Fire discipline won several strategic positions against hostile fire, without our groups firing a shot.

The selection of a suitable firing position, which satisfies the actual needs of the moment, requires great experience. Guard against the possibility of a flanking fire, since changes in direction of the advance at medium and short ranges are next to impossible. One

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carelessly chosen position may check the advance and sacrifice many lives. The distance of the final position from the enemy depends upon our success in the fire combat and on the morale of the enemy and of our own troops. Rare are the instances in which the last distance to the enemy may be successfully covered, if in our last position we do not gain fire superiority.

The greater the losses inflicted, the sooner the will and resistance of the enemy will be crushed. Morale alone will prevent this effect upon an enemy. If both sides are actuated by a high sense of duty the bayonet struggle will determine the victory. The offensive imbues with the higher spirit and the cases of a repulsed attack are rare. The morally weak side usually retires. It is not bayonet losses which decide the success, but the loss of morale at seeing the enemy in the trenches. (Numerous instances of the effect of morale are quoted in the original article.)

The higher the morale, the more stubborn the fire combat. Losses will not prevent an adversary of high morale from holding his positions. His persistence may even make us subservient to his will. Men must be taught not to fear capture so much that they will abandon their trenches to escape it. Capture is a disgrace only when effected before the last cartridge and the last ounce of strength are expended. In general, artillery fire will not demoralize well-disciplined infantry. Shrapnel is more efficacious, but exerts less moral influence than time-fused shell.

Several rounds of well-aimed fire are sufficient to disorganize cavalry. Infantry should be taught to face cavalry calmly with full confidence of success. Bombs for transport guards are highly efficacious when thrown at the horses' feet. One cartridge in each rifle makes infantry invulnerable to cavalry attack.

Two hundred rounds of ammunition per man are more than sufficient for one day. One hit per 1000, if each man fires 150 rounds per day, will inflict a 33 1-3 per cent loss on the enemy and will halt his advance for the day.

Commanding officers must renew the ammunition supply daily from the regimental train. Subordinates must keep the firing line supplied; also a reserve supply on the pack horses. Strict measures are necessary to prevent men from throwing away ammunition on long marches. Frequent checks are necessary.

Premature opening of fire is wrong. It betrays the position. If delayed, the enemy is forced to delay in reconnoitering and may make mistakes. In offense, company commanders order the opening of fire; on defense, the zone commander. A thin line, with full supports and reserves, should be used until the decisive moment. If the supports suffer heavily they must be fed into the line earlier. There is always a remedy for a flanking fire if the commander be sufficiently experienced and cool-headed. To retire always causes more losses than to remain. Coun-

ter attacks should not be attempted until the enemy has been weakened by our fire. Artillery and infantry must combine for a successful advance. A retiring enemy should be pursued with machine-gun fire and long-range fire. Systematic peace instruction alone can give us well-trained troops of high morale, suitable to modern warfare.

**—Fire—Instruction and Training—Target Practice**

[Electric Remote Indicators for Rifle Ranges. *Royal Engineers' Jour.*, Oct, '15. (Reproduced from the *Electrical Review*.) 800 words. 4 photos.]

This describes an electric installation for target ranges made by the Siemens Co. at Spandau, near Berlin. Each of the 18 ranges is fitted with a transmitter and receiver, serving to signal the number of the rings hit each time. The marksman having fired, pushes a button to call the operator's attention to the target; the latter having scored the hit at the transmitter, the marksman is enabled to read the result at the receiver. The system also comprises a telephone plant.

The first cost of this installation is usually more than offset by saving of ground and accommodation. Operating expenses are extremely low, the consumption of power of each transmitter-receiver set being about 28 watts. An additional advantage of the electrical indicator is the faster rate of shooting which it makes possible.

[The Spot Shot Rifle Target. *Arms and the Man*, Jan 6, '15. Diagrams. 700 words.]

There has recently been placed upon the market by Mr. F. C. Reed, of Springfield, Ohio, a very interesting target for gallery practice, on which the spotting of the shot is almost coincident with the pulling of the trigger.

The target used is of cardboard, of a texture such that a light in rear can be reflected through it in the absence of any strong light in front. The lights which illumine the face of the target while the firer is sighting, are extinguished when the shot is fired, and a rear light placed behind the target shines through the cardboard, and makes the location of the hit immediately apparent to the firer. It is the bullet itself which, by the force of its impact on a steel plate behind the target, breaks the contact and extinguishes the front lights, so that the spotting of the hit and the pulling of the trigger are practically simultaneous.

[The Curse of Courses. *The Army and Navy Gazette*, London, Apr 8, '16. 400 words.]

Once before we called attention to the serious check which has been given the instructional routine of newly-raised troops by the curse of courses through which they are made to suffer. It is necessary that officers, non-commissioned officers, and men should know about the instruments of destruction now used, but we submit that the time for these special courses is towards the end of the training of a unit and not at its beginning

or during its progress. Many of the important instructors of a battalion are taken away for these special courses to make experts, while the raw troops are left to the training of their C. O. with a lot of raw subalterns. The battalions should be trained for war in general first. It is a question whether we should continue training new troops as mere fragments of specialists—it looks now as if this war will change from one of positions to one of maneuvers, if we are to win.

[Folding Target for Instruction Firing. By Maj. D. H. Tello. *Rev. del Circulo Militar*, Aug. '15. 1200 words, 4 figures.]

Describes the construction of a small folding target, the total weight of which is 9 kilos. The appearance and disappearance of the target is secured by its rising and falling about an axis on the surface of the ground normal to the line of fall. It is manipulated by one man.

See also

INFANTRY—FIRE—INSTRUCTION AND TRAINING

NATIONAL GUARD (U. S.)—INSTRUCTION AND TRAINING—TARGET PRACTICE

TACTICS—INSTRUCTION AND TRAINING—TACTICAL PROBLEMS

—Fire—Instruction and Training — Target Practice—Targets—Disappearing

[Disappearing Target for Combat Fire with Portable Arms. By Major Domingo H. Tello. *Rev. Circulo Militar* (Argentina), July, '15. 1200 words.]

The basis of this construction is a framework of two light timbers and four supports. On one timber are arranged with spiral springs and hinges small wooden blocks to receive and support the skeleton frames (figure silhouettes) which carry the targets; on the other are arranged small pulley wheels over which pass the cords for occulting the targets.

The material for a squad weighs 39 pounds and can be carried by seven men armed and equipped.

To set up in the field, a trench is dug about ten yards long, 20 inches wide and 12 inches deep; also two pits about three feet deep to shelter the markers.

Two men are required to set up, mark and serve the targets. Communication is by electric bells, for which seven dry cells and a thousand yards of light wire are needed. The wires are laid on the surface of the ground, and signals of combined long and short rings are arranged. (Several examples are given illustrating possible use of this target in field fire and tactical exercise, in scouting, and in advance guard work.)

—Fire—Range Finding

[Auxiliary-Target and Mil-Rule Scale. By Charles G. Davis, Lieut.-Col. 6th Inf. Illinois National Guard. *Infantry Journal*, Mar. '16. Sketch, table, 850 words.]

Credit for the idea of the Auxiliary-Target device is given to Capt. H. E. Eames, 28th Inf., and to Capt. W. H. Patterson, 12th Inf.,

and for the Mil-Rule to 1st Lieut. C. B. Hodges, 4th Inf.

The Mil-Rule is fully described in the Mar-Apr, 1914, issue of the *Infantry Journal*. The Auxiliary-Target Scale may be used to determine ranges, to define objectives, to obtain mechanically a sight setting when an auxiliary aiming point is used, and in sketching. The device consists of a sight leaf with two drift slides, mounted in a piece of hard maple. The device complete is 7 inches by 1½ inches by ¼ inch. Table of fronts and detailed instructions for use are not susceptible of condensation.

—Fire—Rifle Shooting—Instruction and Training

[Rifle Shooting Prospers. *Arms & the Man*. Dec 30, '15.]

"It is reported by the National Board for the Promotion of Rifle Practice that the year 1915 produced an unprecedented revival throughout the country of rifle shooting. Rightly, the board attributes this chiefly to the legislation of last year authorizing the free issue of rifles and—to a certain extent—of ammunition to civilian rifle clubs. More than one and one-half million rounds of ammunition and about 3000 rifles were issued to these civilian clubs.

"The board recommends that Congress authorize the appointment of a commission to investigate the subject of range construction from a national defense standpoint, survey the entire country and recommend a permanent national policy of range construction, naming the geographical locations where such ranges should be situated.

"Cheering reports, and sound recommendations. It is to be hoped that Congress will see the force of these modest requests. Here lies the way to a citizenry "trained and accustomed to arms," which is the nation's chiefest defense"

—Instruction and Training

[The Standard of Training. Editorial. *Infantry Journal*, Feb. '16. 1300 words.]

The different estimates as to the period of time necessary to train a soldier to efficiency must have caused wonderment to the legislators hearing the testimony. The only standard that can be assumed is the test of the world's best experience in soldier making. The character of the adversary determines the amount of training, and the true test is meeting a highly organized, highly trained, aggressive army, equipped with the most modern implements of war, and superbly officered. European procedure of to-day is to intensively train individuals for ten months or a year. So much for the man. As a matter of fact such training is but the beginning. Intelligent teamwork and co-operation are equally important, and can be acquired only through practice. The soldier must be taught to do intelligent work as a member of the squad; the squads must learn their functions as component parts of a platoon; the platoons must be trained into flexible instruments in the hands of the company commander; and the several arms must be

**INFANTRY—Continued**

trained in the combined operations of the division. Only the most perfect possible co-ordination of all forces can insure the success of a modern attack. The necessity for team work is conceded to be worth while in athletics; it is not always appreciated in this country when military training is under discussion.

[An Army of Specialists. Editorial. *Army and Navy Gazette*, Feb 19, '16. 300 words.]

Formerly, with signallers, bandmen, officers' servants, recruits, machine gunners, and others eliminated from company parade, there was but a handful of men left. Now everybody is a specialist. To those mentioned must be added bombers, men who serve trench mortars, and men undergoing various kinds of special instruction. These specialists are found not only at the front, but in the new battalions. They are necessary, but special training should not be undertaken until the battalion has first been made and trained.

[Uniformity in Infantry Drill. By Captain N. Hill, U. S. M. C. *The Marine Corps Gazette*, Mar, '16. 2000 words.]

To help secure uniformity where troops of the different services are serving together or where they move together under the same command, the U. S. Infantry Drill Regulations should be adopted for the Navy and Marine Corps. With certain modifications as to distances and intervals they can also be used on ship board.

The present infantry drill of the Navy is intended to apply only to those troops organized according to Navy standards, and must therefore be altered when used by the Marine Corps, for that Corps is organized after Army standards. It is also believed that for service ashore the Navy should be organized as is the Army for such service. The Army Infantry Drill is superior in many ways to that of the Navy, but the change is urged not on account of errors and omissions in the latter but wholly on the grounds that the adoption of the Army book will make all branches of the service use the same methods, and it can not be denied that all will profit greatly by the change.

Also it must be remembered that the Army, Navy and Marine Corps have frequently served together in the past and will in the future, and efficiency demands that on such occasions all have the same instructions.

[Training of European Troops. *Army & Navy Jour.*, Apr 8, '16. 1200 words.]

All British troops used on the western front, except the regular army and Australian contingent, have been given six to nine months special training. This includes the Canadian contingent. Our military observers report that Germany uses a special eight weeks course of training in addition to the preliminary training at home stations. Men are trained to fire from trenches and trees, to practice concealment, and to construct

trenches. This supplementary training considered by Germany necessary is more than our National Guard gets in two years.

With three years service, France supplements the training of her troops by special work during the twelve days of each twenty-four that they are sent to the rear from the firing line. (This training is not to fit troops for duty in the trenches, but to keep them fit for duty.—Ed.) This instruction is in the principal requirements of trench warfare, such as bayonet fighting, grenade work, target practice, and entrenching.

The Canadian contingent was given six months training at Salisbury Plains, and it had already had a month or six weeks before leaving Canada. This contingent did not reach a strength of 40,000 at the front until after fourteen months of war and with heavy losses and the present supplementary training period, recruitment only maintains this number.

The British central training camp at Havre, France, represents the final word in training for trench warfare. It was established in the summer of 1915. All men must be adjudged fit for service by the Commandant before going forward to the trenches. The instructors are experienced officers and n. c. o.'s returned from the front, some recuperating from wounds or sickness. Each division at the front details a very good officer for duty as instructor for two months.

The course includes musketry, entrenching, first aid, pack saddlery, bayonet fencing, bombing, riveting [revetting?—Ed.], construction of obstacles, particularly barbed wire entanglements, machine gun practice, disabling of guns, and conduct of artillery fire. In musketry, the targets represent service conditions. Men under instruction actually occupy instruction trenches for 24 hours to test their knowledge. The exercises include bomb throwing and trench clearing by bombing, formations for assault, bringing up supports, and attack of trenches occupied by dummies for bayonet practice.

[Directives for the Company Period. By Major Domingo H. Tello. *Revista Militar* (Argentina), Apr, '16. 2700 words.]

Inertia and routine should be avoided in the daily instruction of troops. Instruction has been directed properly if, when the troops arrive on the field of battle, there is nothing to discard as superfluous that has been taught in time of peace.

The officer is the model for his men. His influence should carry them forward to victory, even after the greatest fatigues and heaviest losses. He should always be a loyal guide and counsellor to them. He should share in their joys, sorrows and privations, in this way gaining their confidence. The officer should educate and fortify himself in time of peace for his elevated mission in war.

Infantry is the principal arm; its fire power, together with that of the artillery, dominates the enemy. Infantry alone breaks down the last resistance of the enemy. It bears the prin-



cial burden of combat, and pays the greatest tribute of blood. Our energies in peace time should be devoted to training the infantry soldier for his duties in war. (Here follows a discussion of the fundamentals of infantry training during the company period under the captions of Close Order, Extended Order, Fortification, Field Service, Marches, Rifle Practice, Signalling, Use of Intrenching Tools, Estimation of Distances, Athletics, History, Morale, Civic Instruction, Primary School, Military Hygiene and First Aid.)

[Theoretical Instruction of Recruits. By 2d Lieut. Guillermo Aldana Stegemoller. *Mem. del Ejército* (Chile), May, '16. 3800 words.]

The preparation and instruction of the soldier is covered through theoretical instruction.

The following considerations must be taken into account:

(a) *The characteristics of the conscript.* It is the duty of the instructor to impart not only a military knowledge, but also to educate, through example and discipline, correcting bad and encouraging good habits.

(b) *The instructor should be thoroughly prepared.* To avoid discussions during conferences, all obscure points should be mastered beforehand. The choice of language must be adapted to the mental capacity of those receiving instruction. It is best to hold the conferences during the early hours of the morning, and not wait until the soldier is worn out as result of his activities.

Of the two general methods of instruction, the inductive and the deductive, the former method is the one to be recommended. The facts are analyzed in order to find the application of the rule. At the beginning of each conference, it is not only convenient, but also indispensable to take up for a few minutes a review of the work covered in the previous recitations.

The individual theoretical instruction should extend over a period of sixteen weeks. While the officers are covering the subjects of discipline, duties of a soldier, articles of war, organization of the national government, permissions and complaints, theory of firing, history of the country and of the regiment, and the rudiments of military map reading, the non-commissioned officers should give instruction in deportment, order and police of barracks, manner of addressing superiors, insignias, salutes, honors to be paid to officers, nomenclature and care of the rifle, manual of the piece, and deportment in theaters and public places.

In training recruits, the instructor should be tactful and patient. Recruits of slow mentality, if properly handled, will surprise their superiors by doing their best when they undergo their final test.

[Modern Artillery and Individual Initiative. Editorial. *Scientific American*, Sept 16, '16. 1000 words.]

(Through a consideration of the available details of the operations at Verdun and of

those on the Somme, the following conclusion is reached):

"Intense artillery fire, developed only since the opening of the present year—a fire that sweeps away organized defenses of all kinds and splits up the defenders into numerous small and disconnected groups—makes it imperative that each soldier possess sufficient initiative to act as a military unit when the occasion arises. Discipline is still the big factor, but it must be a form of discipline that does not quench the initiative qualities to be found in almost all men."

See also

INFANTRY—FIRE—INSTRUCTION AND TRAINING

INFANTRY FIRE—INSTRUCTION AND TRAINING—MUSKETRY

MACHINE GUNS—TROOPS—INSTRUCTION AND TRAINING

TACTICS—INSTRUCTION AND TRAINING

Chile

[School of Fire for Infantry and Artillery. By Captain J. Palacios Hurtado. *Mem. del Ejército* (Chile), Aug, '16. 5000 words.]

(The writer points out in this article the great importance of the necessity of establishing a School of Fire for Infantry and Artillery, where artillery and infantry fire problems may be solved. A scheme is suggested as to the best way to carry the above into effect, due advantage being taken of the present elements and of the resources at hand.)

Great Britain

[Eighteen Months with the New Armies. By Brig.-Gen. F. G. Stone. *Nineteenth Century*, Oct, '16. 5500 words.]

The writer held a command in one of the earlier formations of the new British armies for twelve months, including the training period and several weeks in the trenches. Subsequently, he raised and trained one of the latest formations for a period of six months, until nearly time for its embarkation. He seeks to present a picture of the gigantic effort by which Great Britain converted her civil population into a military force.

"A collection of several thousand men and a few hundred officers, brought together for the first time from various parts of the country, without equipment or uniform (so far as the men were concerned), with the scantiest possible accommodation, inadequate and hastily improvised arrangements for cooking and washing, a few staff and commanding officers from the retired list or Reserve of Officers, a sprinkling of regimental officers who had at some more or less remote period served in the Regular Army, a few officers with previous Territorial experience, a fair proportion of officers just commissioned who had been in their school or 'Varsity Officers' Training Corps, and about the same number of second lieutenants without any previous experience of soldiering, either theoretical or practical; added to this a sprinkling of old regular n.c.o.'s of every degree of efficiency and otherwise"—such was one of the new divisions at

**INFANTRY—Continued**

its birth in the autumn of 1914.

Much of the training work required a physical fitness and familiarity with routine not possessed by officers and n. c. o.'s. from the retired list.

While the organization and training were going on, discipline had to be instilled, and all the multifarious activities connected with the housing and supply had to be carried on. To realize this problem, one has to see such a unit in the making. Many difficulties were materially less as time went on. Ultimately, the idea was to quarter every division of the First Army in the Aldershot Command, and those of the Second Army in the Southern Command on Salisbury Plain for divisional training under the supervision of a Training Center Headquarters before being sent overseas for service.

The question of accommodation was a difficult one for many months, especially covered accommodation for horses during the winter 1914-15. Some commanders kept the number of horses down to the minimum, and thus sacrificed training; others took their full quota, and thus sacrificed horses. After the first winter there was no further difficulty about accommodation.

The supply of horses was ample, as the requirements were brought very low by the inauguration of trench warfare.

Lack of equipment caused incredible difficulty in training. Riding could not be taught for lack of saddles and bridles. They were collected from the country and doled out pro rata. Improvisation was the order of the day. Wooden guns and dummy telephone sets, and every conceivable device for getting ahead with technical training in the absence of proper equipment had to be resorted to, and this condition continued for many months. Indoor rainy day and night instruction was hampered by lack of under-cover accommodation. There was a campaign against preventive typhoid inoculation.

The voluntary (?) system of recruiting is attended by many evils. Many volunteer who cannot be spared from industrial activities. Their later recall is disastrous to organization. Skilled chauffeurs and mechanics presented themselves for enlistment in the Army Service Corps, were sent away because there were no vacancies, and enlisted elsewhere. Later, the A. S. C. had to train inexperienced men, while trained chauffeurs were learning to dig trenches.

The worst feature of the voluntary system showed itself when recruiting became slack. Every device was resorted to to bolster up the system. Men were accepted who should have been rejected, and having been accepted were kept under pay to make a numerical showing. Finally, compulsory service was adopted.

In 1915, local units were organized. This gave an impetus to recruiting, and local enthusiasm for these units ran high. These units were raised and outfitted locally and received

some training. A nucleus of officers, many of whom had been promoted from the ranks, and n.c.o.'s who were over age for service overseas, or who had been invalided, were lent as instructors, and the establishment of officers completed by temporarily commissioned second lieutenants. After being licked into shape at "raising" headquarters, they were sent off to divisional headquarters.

In the beginning, much fine material for officers belonged to certain special organizations. In the autumn of 1914, these men were badly needed for commissions. There was difficulty in recovering this material. If a commanding officer recommended one, he would have to recommend fifty others, and his organization would be disrupted just when its division was ready to embark. Such a condition would not arise under compulsory service.

Extensive promotions were made from the ranks of the regular army. These officers were particularly useful in raising and training new units. Selection of n.c.o.'s for the New Army was attended by some difficulty, men being averse to be put in authority over others. Discipline was a novelty, and absence without leave and unpunctuality were regarded with the utmost tolerance. Absence without leave was epidemic in all new units for the first three months, and had usually disappeared in six months. This offense was one of the most serious obstacles to rapid and efficient training.

The first half of the training period gave little appreciable result. About then, however, undesirable material would have been discarded and there came a change after which progress was rapid. During this period a fine *esprit* grew up.

The nation should realize how much the new armies owe to the leaven of officers and n.c.o.'s from the regular army. Their services in all stages and capacities were indispensable, and without them the miracle of the new armies could never have been accomplished. One of the astonishing features was the proficiency attained by artillery drivers, doubly remarkable because men and horses had to be trained together.

The key-note of the training was the necessity for close co-operation between infantry and artillery. This co-operation was achieved, again an impossibility, but for the leaven from the regular army.

Some divisions were fortunate in having commanders appointed straight from the front. Others were fortunate in having sufficient time for training before being sent to the front. The divisions of the New Armies enjoyed one incalculable advantage in being trained as a rule from the start as complete formations. The advantage which accrued from this cause can scarcely be overrated. All learned to know each other and to act in concert to a common end. Some of the latest New Army divisions went overseas in the spring and many of them are in the Somme fighting, where they have established a high reputation.

Germany has taught us that the highest privilege and essential obligation of every citizen is the defense of his country.

Omission to mention the Territorial Force and the regular army does not imply a failure to realize the magnificent services rendered. Their services are always recounted as a simple response to the call of duty, and not as a thing to be waved in the face of an audience.

#### —Instruction and Training—Officers

[Infantry. By George T. Fry, Military Editor *N. Y. Journal*, formerly Col., Tenn., *N. G. Infantry Jour.*, Jan, '16. 1500 words.]

Colonel André has said "a people is worth only what its infantry is worth," and the corollary is, "Infantry is worth only what its officers are worth."

This article is to call attention to the greatest defect that follows the progress of the European war—a lack of sense of proportion, a failure to correlate the mass of reports and facts and to view them as a whole.

The big things are hidden and are revealed only to the General Staff and to similar wielders of the intellectual pick and the analytical shovel.

At the outset of the war we had three chief military factors—infantry, cavalry, and artillery—and we had definite ideas concerning them.

The first piece of snap judgment was to abolish the cavalry. Now we know how perfectly the Uhlans screened von Kluck's sweep. The best guessers did not know whether he was striking at Ostend or Calais. Cavalry could not fight in a trench, either in single or double-rank formation. These writers lost proportion. The artillery then had its day—the infantry had passed. The field-gun having no more effect upon a trench than a handful of pebbles on a tin roof, a better idol had to be found, and it was the howitzer and its high-explosive shell. But these "experts" forgot that the trenches against which this shell is aimed are held by infantry. This brings us back to our subject. There are but two constants in military science—common sense and topography. The relations and uses of the various arms depend now, as they have always done, upon the application of the first constant to the second.

The court of last resort in battle is now and will ever be infantry. Fire superiority plus training are the prime qualities of effective infantry. The big task ahead for the infantry officer of the United States is apparent. With all fiction eliminated, it is fire, always fire, that holds the important place. The bulk of the wounds is due to rifle and machine-gun fire. Absolutely accurate methods of getting the range offer a fine field for inventive genius. The necessity for standardizing the military teaching of regular officers is obvious. Its realization will profit the officer who sees it.

The big need of the moment is simple ideas for training infantry and perfect methods of controlling fire. These two ideas creep out

from under the wreckage of war unhurt by involved assertions and untouched by theory.

#### Germany

[Instruction of Officers in the 48th Regiment, German Infantry. By Capt. Arturo Maillard. *Memo. del Ejército* (Chile), Oct, '15. 2500 words.]

The work described covered the period from Oct 1, 1912, to Mar 15, 1913.

**Practical Work.**—Included gymnastics for all second lieutenants, one hour each week for three months; fencing with saber and bayonets for first and second lieutenants; equitation, one hour daily for two months, for all second lieutenants with less than four years' service; leading the platoon and company at war strength in drill movements and maneuver exercises; for mounted officers, two night patrols covering 30 to 40 km. Each officer (captains and lieutenants) had command of one of the opposing sides in a tactical problem worked out in the vicinity of the garrison.

**Theoretical Work.**—All second lieutenants prepared essays on subjects of tactics, fortifications or military history.

Two war games covering several sessions were had in each battalion, and the lieutenant-colonel directed a game in which all officers of the regiment participated. A sanitary problem was worked out by the medical officers under the direction of the regimental surgeon.

Numerous conferences were held on important military subjects. Those designated prepared their arguments in writing, but were required to deliver them from memory. A critique was conducted in each case by a superior officer assigned by the regimental commander.

Two tactical rides were conducted in each battalion by the battalion commander, one by the lieutenant-colonel for mounted officers of the regiment. In March, a staff ride extending over several days was led by the regimental commander for all field officers and some of the captains and adjutants.

**Other instruction.**—Selected officers from the regiment were under instruction at the School of Infantry Fire, the Aviation School, the Berlin Gymnasium, the Arsenal at Erfurt, and with the pioneer battalion of the division. Candidates for the War College are selected by a process of elimination conducted by the Division Staff. Successful candidates are examined for admission to the College in March.

Officers who are specially recommended from the division for duty with the General Staff are subjected to many tests, and if their work is satisfactory are assigned to the General Staff on probation.

#### Great Britain

[An Estimate of the Value of Training. By James O'Donnell Bennet in *Chicago Tribune. Infantry Jour.*, Jan, '16. 500 words.]

Not the writer's opinion, but the views of men engaged show this psychological phase of the war. The British soldier, once dreaded by the Germans, is no longer even respected by

**INFANTRY—Continued**

him; on the other hand, German opinion of the French soldier has risen.

English prisoners have said: "Our officers are brave but inexperienced," "The officers of the new Kitchener army are not trained."

Germans say that the new Kitchener army is not comparable to the first; that some British troops attempt to cut entanglements while standing up; that they are young, inexperienced troops, guilty of this and similar mad deeds. The British call it "sport," but war is not "sport."

**—Mounted**

[Cavalry and Mounted Infantry. By Brutius. *Rivista di Cavalleria*, Dec, '15. 5000 words.]

The gun, the horse, and the cannon are the three elements with which our troops are concerned, and the results of any struggle depend largely upon the degree of success with which these elements are used. Each soldier must be trained in the use of his proper arm. In the picture of a battle, we may say that the artillery is represented by the mountains that dominate the scene; the infantry, with its mass of detail, gives the picture its salient characteristics; and the cavalry gives it the vivid coloring.

The arm with which a soldier fights has a profound influence upon his sentiments, traditions and sympathies. In order that the use of this arm—gun, horse, or cannon—may become a part of his second nature, he must be constantly trained with it and taught to know its value.

Mounted infantry is neither real infantry nor real cavalry. When it fights it will not have the same tendency to hold fast that real infantry has, nor will it have the spirit of cavalry fighting on foot as a temporary and exceptional measure and awaiting the opportunity for its true rôle of mounted action.

Mounted infantry has been considered particularly suitable for colonial service, and has been used to some extent in Libya. As organized there, it has the great disadvantage of an insufficient supply of horses. All the non-commissioned officers and those men having special functions have their horses, but only 85 horses are supplied for 150 private soldiers. If ten of these horses are sick or lame there will remain one horse for two soldiers. Ordinary marches must be made half mounted and half on foot. If advantage is taken of the mobility of the mounted troops to hasten them into action, only half the company can be sent, and its strength on the firing line is further reduced by the number of horse-holders. Now 150 rifles are sufficient to exercise an important influence on an action in the colonial service, but the arrangement described reduces the efficiency of the company in action to one-third of what it should be.

In addition, these troops have been supplied with a machine gun section for each company, but these sections are not organized like those with the cavalry. The guns are

carried on horses led by men on foot. No doubt the guns are of great value in colonial actions, but their mobility may be compared to that of field artillery drawn by oxen.

In these times the colonies are fertile sources of trouble, and the colonial troops should be of a high standard of efficiency. The mounted infantry does not meet the requirements. It would be better to employ real infantry for infantry purposes and real cavalry for those duties in which the qualities of cavalry are needed.

**—Night Operations**

[Points of View and Rules for the Preparation and work of Infantry in Night Exercises. By Lt.-Col. José Maria Argañaraz. *Revista Militar* (Argentina), Apr, '16. 3000 words.]

(This is a comprehensive program for progressive training of infantry in night operations.)

Night operations are indispensable in war. They should be included in any program for infantry training. The recruit period is for three months. The instruction at night includes at least one practical exercise per week and is continued throughout eleven weeks. Two exercises are for individual instruction; nine are for the work of squads and sections.

Twelve exercises during a period of three months are given for the company; they are designed to cover all phases of movements at night over strange ground in the presence of the enemy. The enemy is represented. Twelve exercises in a period of eight days are planned for the battalion. The first and twelfth follow as examples of the scope and thoroughness of the work.

"First Exercise: A night march of from 25 to 30 kilometers with security detachments thrown out, meeting engagement, enemy represented."

"Twelfth Exercise: Attack and defense, two companies on each side, flank protection, combat reconnaissance, communication, selection, occupation and entrenchment of defensive position, advance to the attack and entrenchment of attacking companies, artificial illumination of terrain by both sides, the counter attack, assault of the position."

Exercises for regiments and reinforced brigades are advocated to the extent of bringing about complete nocturnal engagements involving the use of the combined arms. Brigade exercises should begin before dark and terminate after daybreak. Machine guns, instruments for artificial illumination of fronts and telephones should be utilized. (Extra equipment for night work of one company is tabulated.—Ed.)

**—Protection for**

See also

HELMETS—ARMORED

**—Tactics**

See also

TACTICS—COMBINED ARMS

TACTICS—INSTRUCTION AND TRAINING

**—Tactics—Co-operation with Artillery**

[Co-operation Between Artillery and Infantry in the Great War. By Brig. Gen. F. G. Stone, psc, R. A. (A lecture delivered at

the Royal Artillery Institution, on Thursday, Nov 25, 1915.) *Jour. Royal Artillery*, Dec, '15. 5500 words.]

The principles governing the co-operation between artillery and infantry as enunciated in the training manuals published before the war, have stood the test of war remarkably well.

There has been a noticeable difference in different divisions in training in co-operation. In the six divisions of the Expeditionary Force, it was as satisfactory as peace training could make it, and such deficiencies as were found to exist were remedied as the campaign progressed. In other divisions of regulars which had not had peace training as organized divisions, this co-operation was deficient, not through the failure of commanding officers to understand the theory, but from lack of opportunity to practice it.

Perhaps the best results have been obtained in some of the divisions of the New Army, especially those to the command of which at an early stage in the training period, a major general from the front was assigned and who later commanded the same division in the field; and if in addition, brigade and battalion commanders had held their commands at least three months before going abroad, it became possible to establish the closest support between the two arms.

In the training of new divisions, the spirit of co-operation should be built up gradually, first by staff rides and small exercises and then by brigade and division exercises, units being grouped together for training as it is expected to use them in the field. During the brigade training, the G. O. C. Divisional Artillery will supervise the work of the artillery and will assist by advice both infantry and artillery commanders. Tactical exercises under the group commander should be devoted primarily to the execution of a "set piece in attack"; since only by practice can every detail of co-operation be perfect in execution. The principle should be insisted upon that the infantry commander inform the commander of the supporting artillery as early as possible as to what he proposes to do and how he proposes to do it; and that the artillery commander take station with the infantry commander, sending forward an artillery staff officer with a telephone line to keep in touch with the firing line. The infantry and artillery telephone lines ordinarily will be used by these two arms, but neither arm should hesitate to use the lines of the other if necessary. It should be emphasized early in the training period that co-operation requires an equal measure of initiative from both infantry and artillery, and one of the first lessons to be learned by infantry officers is how to describe accurately and intelligently a target which they wish the artillery to engage.

Since the time available for training is short, it may be necessary to carry on brigade and divisional training simultaneously. In the 18th Division, each brigade had one day a week with its affiliated artillery under the infantry brigadier, and the major general had

one divisional operation, which toward the end of the training was a two-day affair.

In divisional operations, the divisional artillery commander establishes his headquarters with division headquarters, and if necessary to leave headquarters for any purpose will leave a staff officer there. The artillery commander will keep in close touch with the general staff at headquarters and with the division commander, so that the artillery may be at all times ready to carry out the intentions of the division commander.

We get now to what has become the normal kind of warfare on the Western Front.

A division is allotted to a certain section facing the German trench line, and occupies infantry trenches suitably disposed for holding up any German attack coming against that section. An artillery brigade is allotted to each section corresponding with the infantry allotment, these allotments conforming as nearly as possible to the groupings during training. The howitzer brigade usually will be split up and the batteries distributed between the gun brigades.

Each battalion of infantry in the trenches is connected by telephone with the battery of the artillery brigade affiliated to its own infantry brigade. Thus a company commander in the trenches can call up the affiliated battery at any time. A battery officer is in the trenches to observe fire and to keep his battery informed of what is going on in his front. Each battery commander is in telephonic communication with his brigade commander, and each battalion commander with his brigadier. The fighting post of the artillery brigade commander will be close to that of the infantry brigadier.

From infantry and artillery brigades, separate telephone lines run to the division commander and to the divisional artillery commander, respectively, whose normal headquarters are in close proximity and fighting stations one and the same.

The intimate grouping of infantry and artillery brigades for trench warfare does not imply that the artillery brigade commander is placed under the command of the infantry brigadier; but the intimate grouping permits the artillery to respond to the needs of the infantry without the delays or congestion caused by a constant reference to a central authority where centralization is unnecessary. The commander of the divisional artillery must always be in a position to use any battery for any purpose irrespective of the section normally allotted to it.

Until recently it was believed that a continuous offensive, properly conducted, with no check in the torrent of fresh troops, must be able to break through the German lines, but this policy cannot achieve the results hoped for, as the effect of the preparatory bombardment can be only temporary, and the impetus of the infantry attack inevitably will reach the limit of its penetration as the effect of the preliminary bombardment and subsequent supporting fire wanes. It must be recognized that a certain psychological moment will be

**INFANTRY—Continued**

reached in every successful attack when it behooves the commander to consolidate his gains, and reorganize his troops for a fresh effort at the earliest possible moment. The rôle of the artillery must be to arrange beforehand to give effective support against counter attacks directed at points of tactical importance.

Preparations for attacks by one or more divisions must be most elaborate. The preliminary phases of the infantry attack no longer exist in trench warfare. The infantry attack commences with the assault. The artillery opens the path for the infantry by destroying the enemy's accessory works, first line trenches and shelters in rear, together with the second line trenches and communications. As soon as the preliminary bombardment has effected its object, a final bombardment by bursts of rapid fire will take place and on signal or at a prearranged time, the infantry will be launched to the assault. At the moment of the assault, the guns will increase the elevation to create a curtain of fire 300 yards in rear. As soon as the front trenches are carried, the curtain of fire must be moved 300 yards further out to cover the attack of the second line, and at this stage the guns must be brought forward to demolish any accessory defenses remaining undiscovered until they suddenly open on the assaulting columns at close range. Artillery officers observing in the front trenches should go forward with the infantry, taking their telephone lines and keeping their battery and brigade commanders informed of the progress of the attack. Telephonic communication must be supplemented by visual signals. It is essential that the artillery know where the infantry is.

[The Problem of the Western Front. By Edward Foord. *Sphere*, Feb 12 and 19, '16. 3100 words. 5 diagrams, 2 photos.]

**I. Simple parallel trenches.**

In attacking along a front of simple parallel trenches, any concentration of artillery or troops at any portion of the Allied line is observed by the German airmen, and the Germans immediately take counter measures. Even if the concentration were not observed, the prolonged bombardment that must precede an attack is sufficient warning to allow the counter-concentration to be made by the means of transportation now available.

After the bombardment has destroyed the wire entanglements and broken down the trenches, the infantry is usually able to move forward and occupy the first line. It now takes time to organize the position and reverse the trenches, and during this time they are subject to an effective bombardment at ranges exactly known. This bombardment may be accompanied by the use of asphyxiating gas if the wind is favorable. This may drive out the troops or they may be driven out by a counter attack. If the occupied trenches are held, it usually has the effect of creating a dangerous salient in the line.

**II. The development of the linked redoubt on the German side.**

On the western front, the German line has at short intervals linked redoubts, roofed and protected by concrete and steel plates where advisable to do so. These redoubts are armed with machine guns and possibly light guns, capable of delivering a murderous fire upon any troops endeavoring to penetrate between them. These redoubts have been actively encountered at Loos and on the Tahure line. Their use brings up the question of artillery support of infantry in attack. (The tactical employment of field artillery is here traced from the Seven Years' War to 1870.—Ed.) The tendency has been to concentrate the field artillery and since Napoleonic times, to follow up the infantry in attack.

In the present war, following up infantry in attack has hardly ever been done, at any rate more than tentatively. Artillery preparation has been practised on a gigantic scale. There has never been anything like the tremendous storms of artillery fire preceding the German attacks, but the underlying principle seems to have been that of substituting artillery for infantry. The infantry attacks following these bombardments have frequently been dealt with by infantry which has passed through the bombardment without becoming demoralized. Had the attacking infantry been supported by artillery, it is probable that the attack would have succeeded. The success of the Germans against the Russians has been principally due to sheer power.

The principle of direct artillery support for infantry does not seem to have taken much hold anywhere, yet its importance is great. The most extensive artillery preparation may fail to reach certain positions, and their possession by the enemy may wreck an infantry attack that is not supported by artillery carried forward with its advance.

Enfilade fire from a single undiscovered and unsilenced redoubt may stop the advance of a whole division. The clumsy artillery of Napoleonic times could be gotten forward with the infantry. Modern means of traction should solve the difficulty. The guns should be able to advance firing. Motor carriages with bullet-proof shields would solve part of the difficulty. The gun and its tractor (or pusher) might be built separately. Spare tractors could then remove disabled guns, thus preventing the loss of artillery in case of a repulse, which is one of the difficulties in pushing forward artillery in the support of infantry.

[Trench Warfare. The Attack of Intrenchments by Artillery and Infantry. By Colonel Z. *Revista de Caballeria* (Spain), May, '16. 2700 words.]

[Continuation of a preceding article.]

The attack of intrenchments is hopeless without the aid of artillery. With reference to the amount of artillery to be used, the opinion is general that there can not be too much. Artillery and infantry without modern equipment exist only in name.

In the same proportion that there must be economy in the sacrifice of soldiers, must there be prodigality in the use of guns and howitzers. There must be ammunition enough to permit its use without restriction.

The artillery is created and used solely to *love* the infantry and to *serve* it in every way possible. The artillery should think with the brain of the infantry, and see with its eyes.

The infantry should designate objectives for the artillery, since it is this arm that appreciates the danger points and knows definitely where fire should be directed. The eyes of the artillery are the observers, who should be with the infantry in the trenches. The artillery should place the guns where it pleases but the commander and the observers, the brain and the eyes, must preserve the most intimate contact with the infantry. The attacking infantry requires two things: 1st, to know where to go and to see how to go; 2d, to receive the greatest possible assistance from the artillery before, during, and after the assault. The most dangerous period of all for the attackers is after the position is taken when the enemy concentrates his fire upon it and makes a counter assault. Surprise action by concentrated artillery fire is to be sought. The maximum effect in the shortest period of time should be striven for, as this naturally renders the surprise more complete.

It is a grave mistake to try to fix in advance the time of duration of the artillery fire. The fire should continue until in the opinion of the commander of the attacking force, it has accomplished its purpose. When the infantry advances to the assault the artillery protects it with a curtain of fire to the front and both flanks. In the rectangle of fire thus formed, no enemy should escape destruction.

In order to make the fire effective, the very closest touch must be kept between the artillery and infantry. Telephone, usual signals, etc., are of value, but the artillery commander and his assistants must be with the infantry commander, as in this way only can fire properly be directed.

The fundamental principle in the employment of artillery is that it should work with and for the infantry.

See also

ARTILLERY—TACTICS—CO-OPERATION WITH INFANTRY

ATTACK—FRONTAL

(Article: "How may the German Front be Pierced?")

—Use of in European War

[Importance of Infantry. From *Naval and Military Record*, of London. *Army and Navy Register*, Feb 26, '16. 200 words.]

Although it is still true that heavy guns and high explosives are of the greatest importance in this war, the infantry seems to be coming into its own again. According to General Percin, the French no longer regard artillery as the most formidable branch of arms on the battlefield. Infantry is now considered the principal branch, for on the infantry

can gain fresh ground and retain it. For a time artillery is pitted against artillery, but its activities are practically restricted to supporting the infantry. Very often when the infantry stops in its advance the big guns will stop also. The firing of shells depends largely on the movement of infantry and this constitutes "combined action."

Gen. Percin believes that when the Germans are sent forward in close formation there is little of this harmony between the fire of the big guns and the advance of the infantry, and that, as a consequence, the artillery very often fire into their own men.

See also

INFANTRY—FIRE—IN EUROPEAN WAR

## INTERNATIONAL LAW

See

BLOCKADE

ENTRENCHMENTS

ESPIONAGE

NEUTRALITY

PROPERTY RIGHTS (IN WAR)

RIVERS—NEUTRALIZATION OF

WAR—TREATMENT OF ENEMY ALIENS IN

## INTRENCHMENTS

See

ENTRENCHMENTS

## IODINE

—As an Antiseptic

[Iodine as a Military Antiseptic. *Scientific American*, Oct 14, '16. 600 words.]

Iodine is coming into extensive use in the armies in Europe as an antiseptic. Tincture of iodine is the form usually employed, but alkaline iodized hydroxyl (iodide of sodium three parts, hydroxyl 12 volume strength 100 parts, and distilled water 100 parts) is an excellent solution. It should be freshly prepared for use, and has a certain advantageous penetrating action. A search has been made to determine the best and most economical method of applying iodine. The main point is the ability to apply a small amount without waste. One method is a combination with soap in a lead tube. At the mouth is a small wad of cotton. By squeezing a very small amount of iodine can be expelled through the cotton. The tube is lined with paraffine. Another method is to put enough iodine for a single application in a glass tube. The tube has two grooves around the middle with a file scratch between. By the grooves a small cotton pad is tied around the tube. When the tube is broken, the contents run out and are absorbed by the cotton pad. The pad is then applied to the wound.

## IRELAND

[The Strategic Situation of Ireland: A Retrospect. By T. Miller Maguire, M.A., LL.D., F. R. Hist. Soc. *United Service Magazine*, July, '16. 3200 words.]

There is no country like Ireland of such small area, about 32,530 square miles, with greater natural opportunities for success in regard to commerce and shipping. The coasts are so surrounded by safe anchorages, are so indented with inlets and bays, and the country

**IRELAND—Continued**

is so intersected by inland navigation facilities, that no part is more than about 25 miles from some water communication with the sea. It is also difficult to find any other country whose strategic situation is superior to Ireland not only as regards the contiguity of Great Britain, and the nearness of its ports to all parts of the eastern isles and coasts of America, but to France, the Iberian Peninsula and the Mediterranean. Its population is relatively small: in 1841 it was 8,175,000; in 1881 it was 5,174,000, and in 1911 only 4,390,000.

The fact that stands out is Ireland's flank position. Even as Britain occupies the commanding western flank position and threatens all the western lines of communication of Europe, and all its routes to America from the St. Lawrence to the Straits of Magellan, so Ireland is on the flank of Great Britain and its occupation by foreign foes would paralyze the British sea supremacy, which was rapidly becoming important as early as the thirteenth century. Ireland had many harbors well suited for the reception of the vessels of that period and hence the desire on the part of other nations to utilize Ireland as a base against England. Therefore, since the majority of Irish during each dynasty were discontented, there arose that singular feature of Irish political and military history that whenever England was engaged in any critical struggle with some foreign power, Irish turbulence came to a head and resulted in civil warfare. Conversely, every able adversary of England has fixed his strategic eye on Ireland as likely to give an opportunity for flank attack on England and Wales before the union with Scotland in 1603, and against the whole of Great Britain since then.

England holds that even as Great Britain's geographical position was the basis of her people's marvelous power and wealth, and as this depends on its flanking strategic ports and bays—so Ireland, as quite outflanking and commanding every avenue of British commerce, must never be allowed to develop into fatal domestic hostility to the sister isle. Hence she cannot allow it to fall into hostile hands and to be turned into a base for naval, military, or aerial attacks either against herself or her commercial lines which are now vital to the existence of a population largely dependent for food, trades, and materials of industry on Canada, the United States, and the West Indies.

The "Pale" or territories in the center and east of the country, and also Munster and various towns which were also a relatively early settlement, have continued to be disaffected much longer than the northern Irish. Northeast Ulster is now the most loyal part of Ireland. Apart from religious differences, Ulster admits that in spite of the sea barrier which has hitherto facilitated rather than barred intercommunication between the two islands, Ireland is as much a vital part of the natural British community as is Scotland itself. The last great rising of the Irish clans

was an Ulster rising in 1641 which developed into a Catholic and Royalist rising.

Ireland's strategic importance still remained as great after Cromwell had conquered and pacified it in 1646-1649, and the settlement of 1689 was really consolidated there. The efforts of the last Stuart king and his French allies were foiled in Ireland as a preliminary to the long wars in alliance with the Dutch that were fought out, 1690-1713, in Belgium and Spain, and which made England the leading European Power.

The Irish campaigns of William III might well have resulted in complete defeat and in the destruction of the power of Holland and England combined, by Louis XIV, but for Admiral Sir George Rooke's victory off La Hogue in 1692. In 1745 an Irish brigade of emigrants, who enlisted under the French colors and served in Belgium, stood up bravely against the troops of King George II at Fontenoy. Then during the Seven Years' War, from 1756-63, the Irish Parliament was at one with the British, and Hibernia practically at rest. But during the war with the United States, 1775-83, when all Britain was imperilled in every direction, the Irish volunteers arose and demanded the legislative independence of Ireland, which was granted in 1782 without civil war. The union of the two Parliaments of Dublin and London was brought about in 1800 and since then Ireland has furnished Britain with a constant stream of gallant officers. It is plain to be seen that the flank position of Ireland makes it as important to the Empire as the southwestern coasts of England itself with their sublime naval and military records.

**ITALY****—Army**

[The Italian Army. Impressions at the Front. By Emile Colombi. *Revue Mil. Suisse*. Feb, Mar, '16. 9000 words. Illustrations.]

**I. The Pacifist Policy of Italy**

The foreign policy of Italy before the war was based on the Triple Alliance. This treaty was considered by the government as a sufficiently powerful safeguard to guarantee the state from surprise and any external dangers that might menace it.

Many prominent authorities did not share this optimism; they thought that the Austrian frontier should be fortified. This matter was pretty well neglected except in the Trentino and Cadore, where forts were built.

Austria acted differently, as is proved by the numerous forts along the frontier and the great military roads.

At the beginning of the European war, the Italian army was not prepared to undertake a great campaign, but the real motive for her not marching beside the two empires should be sought in the absence of the conditions specified in the treaty of alliance.

**II. The Preparation**

The Italian general staff and the heads of the different departments took advantage of



the period between Aug, 1914, and May, 1915, to complete the armament.

The following figures cannot be taken as an indication of the present strength, because there has been a gradual increase. At the beginning of the war, Italy had mobilized: 94 regiments of infantry, grouped in 48 brigades, 25 divisions, 12 army corps; two regiments of grenadiers; 12 regiments of bersaglieri (each of which had 1 bat. of cyclists); 8 regiments of alpini; 36 regiments of field artillery; 2 regiments of heavy artillery; 2 regiments of mountain artillery; 10 regiments of siege artillery; 29 regiments of cavalry; 6 regiments of engineers; 1 battalion of technical arms; 1 battalion of aviators.

### *III. The First Task of the Army*

War was declared by Italy on Austria, and the aim of the general staff was to seize a new frontier easier to defend. The Austrian staff had figured that it would be two weeks before the Italians could take the field. For this reason, the Trentino was held by insufficient contingents of territorials.

The first care of the Italians was to occupy dominant positions in the Giudicarie valley, the Adige valley and on the whole Trentino front, and to make there defensive works so strong that they could be held by few troops. The main body of the army was to be thus available to withstand the attack that Germany had threatened to make. This work was efficiently carried out and the first objective thus achieved.

### *IV. The Italian Offensive*

About the middle of June, the Italians gained Plava on the Isonzo and its heights, which operation was the most difficult one accomplished in this first part of the campaign. This put them on the line between Tolmino and Gorizia. Operations were begun against Tolmino, and at Monte Nero, the exploit of the Alpini was magnificent. In a night surprise they seized the summit (2245 m.).

There was another offensive to gain the valley of the Drave, so as to cut the great railway artery of the Pusterthal.

On the Carso, they gained the bottom of the Doberdo valley.

In the Dolomites, they conquered the basin of Cortina d'Ampezzo, certain parts of the great Dolomite road and the Col. de Lana. In the Trentino they occupied the Bezzeca, the valleys of Concei, Ledro and Iragarina, which constitute a semi-circle around Riva. Bargo, in the Sugana valley, and the valley of the Calamento also fell into their hands.

### *V. The Difficulties to be Overcome*

Austrian official circles have always cherished the hope of reconquering the Italian territory lost in 1859 and 1866. It was a real government program. At the expense of hundreds of millions of crowns, a first belt of forts was built on the Italian frontier, a great wall of steel and granite. There is a second line about Trent. The Austrians are real masters of the art of strategic construc-

tions and their modern type forts are models. These are well connected by secondary works and fine military roads. Close to the frontier, the Austrians built bases with a view to the invasion of Italy. The Grand Duke Ferdinand was much interested in this work and frequently spoke of the necessity of reconquering Lombardy and the Venetian provinces.

The early experience of the war discounted the value of forts and made the Austrians show feverish activity in the construction of trenches, redoubts, casemates, lunettes, barbed wire entanglements, and other works. Roads were built leading to heights where heavy artillery could be placed to advantage. The works evidently pointed to a great offensive against Italy.

Particularly marvelous are the defensive works of the entrenched camp of Gorizia. If the enemy occupies one of these positions, the others can open on it a fire so violent that the occupant (according to the conception of the Austrian general staff) would have to retire at once. The Italians, however, have seized more than one of these positions and held them.

The forts are so arranged that no dead angles are left and they all have the Isonzo as an obstacle. Gorizia surpasses as a strong place the Belgian fortresses, Przemyśl and the Russian fortresses taken by the Germans.

### *VI. The Co-operation of the Different Arms*

From mid August to late September I visited the different sectors of the front and I noticed at once the good co-operation of all arms. All branches, except the mail service, functioned well.

The service of supply in provisions works with perfect regularity. The government furnishes supplements of wine, coffee, chocolate, and cigars in greater quantities than in Switzerland. In the high mountains the ration is much richer than in the valleys and plains. A successful trial has been made of replacing meat in part by cheese.

The satisfactory results obtained by the Italian army are due especially to its engineer corps, to the power of its artillery, to the tenacious fighting qualities of its infantry and also to the good co-operation of all the services. In all of this, the civil mobilization has played no small part.

### *VII. The Supreme Command*

On the day of the declaration of war, the king of Italy went to the front and he has not left it since. He maintains a continual contact with all the units of the army. His example of activity, perseverance and devotion has a good influence on the morale of his troops.

He has, as chief of staff, General Cadorna, of the family of the Counts Cadorna of Pallanza. Luigi Cadorna, a man of lively intelligence, much perseverance and method, has risen rapidly in his military career. The ascendancy which he has is due to his military virtues, to his competence, to his faultless equity, but especially to his profound knowl-

**ITALY—Continued**

edge of men. He knows how to judge the intrinsic value of a leader of troops and is guided only by consideration of military science.

General Porro is assistant chief of staff, a position created shortly before the declaration of war.

The excellent preparation of the Italian army is due to General Zuppelli, Minister of War.

The events of the past eight months have shown the great homogeneity of the supreme command and the perfect harmony that exists among the chiefs.

**VIII. The Infantry**

(a) *The Elite*.—The term of service in Italy is two years. The young recruits are less developed when they report than is the case in Switzerland. However, thanks to the assiduous training, a remarkable homogeneity is finally obtained. The Italian soldier is profoundly attached to his family and to his country. By an appeal to these sentiments, anything can be obtained from him. He is more robust and enduring than might be supposed from his stature. It is extraordinary how these children of the South have become acclimated to the severe winter of the high Alps. Besides, the Italian soldier is frugal and temperate by nature.

All arms are now provided with the grey-green uniform. The foot soldier is provided with the knapsack, breadsack, a water-bottle made of poplar-wood; he carries on the belt a cartridge-box with a capacity of 90 cartridges. He has the inevitable cooking-tin and a shelter tent. Each soldier carries besides, two pairs of shoes.

In many respects the élite of the Italian infantry has not always enjoyed the reputation which it deserves. It fights equally well on the plains or in the high mountains and maintains perfect order even when its officers are wounded or killed.

(b) *The Territorials*.—Mobilized Italians from 32 to 39 years of age, constitute the territorial troops, corresponding to our landwehr. They are fathers of families and are used in the supply services. Their discipline is good, and I have never heard one of them complain.

There are several battalions of territorials on the Isonzo and the Carso, whose conduct in action has been admirable. They have perhaps less dash in the attack than young soldiers but they have more resistance and perseverance in action.

(c) *Bersaglieri and Alpini*.—On a peace basis, there were 12 regiments of bersaglieri and 8 of alpini. The bersaglieri were first organized (in 1836) with a view of creating a corps d'élite in the Piedmontese army. They were to be subjected to severe training, to acquire great agility, to be hardened to rapid marches, and well trained in shooting. They were given light equipment and an accurate rifle.

The principal task of the bersaglieri was to harass the enemy continually. They were to am-

bush incessantly and to fire on the enemy officers. Captain Lamarmora was the first instructor; he was of robust physique and a man of iron will. He subjected his men to the maximum effort necessary to attain the perfection he had in view. His successors have followed his principles strictly. Although they were equipped and trained for fighting in low or rolling country, they have adapted themselves to mountain warfare. The honor of conquering the summits was reserved for the alpini; nevertheless, the bersaglieri have some brilliant exploits to their credit in mountainous regions.

The bersaglieri are very popular in Italy. It is with profound satisfaction that young and old watch them pass in review, at double time, plumes waving and with a somewhat boastful bearing. For the Italian people, they are the embodiment of courage, of stalwart youth, always ready to sacrifice themselves for the country's defense. The field music of the bersaglieri knows no sad notes, but only gay marches, full of life.

The character and task of the alpini are completely different. During their two-year period of service they live in the Alps. Each battalion recruits its men in the Alpine zone of which it is the center.

I had shared the opinion that infantry could be used in the mountains with only slight preparation. After my excursions to the Italian front, I am convinced that the alpini answer a real need.

The alpini are noteworthy for their spontaneous modesty. There is no boasting among them, no bragging. They make few gestures, they talk very little. They are true mountaineers.

**The Artillery**

In a campaign having essentially the character of siege warfare like this one, the artillery necessarily plays a very active part.

The mountain artillery has been useful against enemy camps on the heights, in surprising groups forming in the valleys and against supply columns. Its action against trenches has been less efficacious, though it often serves to destroy barbed-wire entanglements.

The Italian field artillery has performed well. It was armed, at the beginning of the war, with Krupp guns. Some regiments had the Deport, which has since been perfected by the general staff. It has a split trail, which allows a great angle of elevation and permits it to be easily placed on slopes.

The heavy artillery was already powerful at the beginning of hostilities and it has since been developed to a high degree of efficiency.

**Engineer Corps**

The Italian engineers have had a difficult task. Since the army has been on enemy territory, the engineers have had to repair the roads destroyed by the Austrians in retreat. These were frequently along precipices, but the work was done with incredible promptness.

The Italian engineers have excelled espe-

cially in the construction of mountain roads. The artillery had to be transported to dominating positions, frequently to heights regarded by the Austrians as inaccessible. This was often done by hand, at the cost of much labor.

The Austrians followed suit, but, thanks to the activity of the Italian engineers and their speed in road construction, the Italian army had the better of the race for the heights.

In their work, they were much aided by troops of the line.

#### *The Cavalry*

The cavalry has had little opportunity to show its worth. While waiting for conditions more favorable to their arm, many officers, non-commissioned officers and soldiers of the cavalry have gone into other branches.

#### *The Officers*

Italy has several schools for aspirant officers: at Pinerolo, Naples, Modena, Rome, Turin, Parma.

The education of officers and the regulations impress upon them that they must treat their subordinates with consideration.

The higher command is well satisfied with the work of the reserve officers, taken from their civil occupations.

The Italian officer is always polished and courteous. Civil life has made the reserve officers more communicative than their professional colleagues.

Losses have been great among the officers, as they have a tendency to give the example in going to the front. In spite of losses, the grade of officer is much coveted by Italian youth, and the applications far exceed the vacancies.

#### *Discipline*

The Italian soldiers have a great tendency towards individualism, but their discipline is good. This is due to the weight gained by the nationalist policy and to the understanding that the officers have of their men. By talking to them as to a comrade and by taking an interest in their well-being, they are able to do anything they want with them. The soldier has an instinctive tact that prevents him from taking advantage of his officers' attitude. Officers are rarely obliged to punish.

#### *Conclusion*

The Italian army does not seem the least bit exhausted after seven months of war. In Italy, the number of robust men who have not yet been mobilized is striking. The war has been conducted on enemy territory and Italy preserved from the horrors of war. Civil life goes on without apparent interruption.

The operations have been so scientifically and prudently conducted that the army has great confidence in its commanders.

Italy intervened voluntarily and spontaneously in the great war; it took this decision when the Russian army was obliged to retreat rapidly. After seven months the nation is more than ever unanimous in keeping up the war until the desired object is ob-

tained. The Italian people has achieved in this war the national unity to which it has been aspiring for a long time.

Mr. Roosevelt referred to the Italians as a people having lost their warlike spirit. But they have demonstrated that this is not the case. They are firmly resolved to gain and maintain the natural frontier of their country.

#### **—Army—Artillery**

See also

FIELD ARTILLERY—USE OF IN MOUNTAIN WARFARE

(Article: "The Use of Field Artillery in the Alps")

#### **—Army—Libyan Troops**

[Native Troops for Libya. By Gillo. *Riv. Mil. Italiana*, June, '16. 1500 words.]

One of the important problems resulting from the Libyan War is that of creating a force of native troops. The problem differs from those of the French in Algeria and the British in the Transvaal, because of differences in the characteristics of the country and its population. White troops must form the garrisons of supporting points and natives must form the columns for active operations.

A large enrollment of natives is desirable. The first units should be used as guides and for information service. Racial rivalries between different elements of the population should be brought into play. Native leaders should be recognized with office and emolument. The good will of the natives should be secured by pensions to the wounded and to the families of those who die in the service.

In addition to regular organizations there should be irregular bands under native officers, made up of the most warlike elements, for operations against fierce hostile tribes.

Enlistment should be for a short period, to be extended voluntarily. The pay should be liberal according to the native standard. Natives that are to operate beside white troops should be armed with the rifle *91*. The irregular bands should be armed with the musket *70-82* and with the *scitol*, the terrible curved knife used by the natives in hand-to-hand combat. Their uniform should be of extreme simplicity and their baggage should be limited to flour and cartridges.

#### **—Army—Staff**

See

STAFF

(Article. "Composition of Headquarters," etc.)

#### **—History**

[The Martyrs of Italian Independence. By Capt. Alfredo Donadeo. *Riv. Mil. Italiana*, Aug, '16. 9500 words.]

The soldiers of our army of today should know the story of Italian independence, in order that they may draw from that story the inspiration to sustain them in the sacrifices they are now called upon to make.

The development of the European nations from the chaos of the Middle Ages has been accomplished at the cost of great struggles

**ITALY—Continued**

and much shedding of blood. For Italy the way has been rougher and longer and more painful than for the rest. The revolution in Italy had its beginnings in the early years of the 19th century. Although Napoleon was a despot in his relations with Italy, he was at least an intelligent and enlightened one, and he caused the ideas of the French Revolution to spread through Italy. After his fall the sovereigns of Europe formed the so-called "Holy Alliance" with a view to destroying all vestiges of liberty. There was a lack of leaders, but they finally came: Mazzini, Victor Emmanuel, Garibaldi, and Cavour.

Even before this time there had been many martyrs to the cause of liberty. Uprisings had taken place in Naples, Piedmont, and Lombardy, and many patriots had suffered death, imprisonment, or exile. The accession of Louis Philippe to the throne of France aroused new hopes of Italian independence. The bitterest enemy of the patriots was Francis I, Duke of Modena, who pretended to be a friend of liberty, but who, when the hour for action arrived in February, 1831, used his power to thwart the plans of the leaders with whom he had been in consultation, seized them and their followers, and had 212 condemned to death, imprisonment, or the galleys.

Between 1831 and 1849 there was an uninterrupted series of disasters, in which many patriots met their martyrdom. In Sardinia, Piedmont, Lombardy, Venice, Romagna, Tuscany, Calabria, Sicily and Bologna many young and ardent Italians were put to death for their activities in the cause of liberty. Their patience, devotion and courage should be an inspiration to the present generation.

Their labors and sufferings were not in vain. Gradually, in one Italian state after another the rights of the people were recognized by statutes. In some cases this came through fear on the part of the rulers; in others, notably in the cases of Charles Albert and Victor Emmanuel II, it came from real sympathy with the cause of the Italian people.

From 1849 to 1850 was a period of preparation. The hopes of Italy were concentrated in Piedmont and the House of Savoy. But even after the light had begun to break, there were still parts of Italy, particularly in Lombardy and the two Sicilies, where tyranny continued to wield its power. Even the Austrian officials were impressed with the heroism with which the Italian patriots went to the gallows.

In 1870 the unification of Italy became an accomplished fact. But the work has not yet reached its full completion. There still remains to be redeemed a vast territory, peopled by the Latin race, and belonging to Italy by every consideration, historical, ethnological and geographical.

It is now the task of the Italian army to finish the work begun by the heroes of the past, and to plant the Italian flag on the boundary fixed by nature. The struggle is a titanic one, not against human enemies alone, but

also against mountains and the rocks. Miracles of audacity, of energy, of courage, are being wrought every day. Every soldier should be a worthy successor of the martyrs who sacrificed themselves in the hopeless struggle for liberty, and every boy who is preparing to enter the army should know the story of that struggle.

[Expedition of the Duke of Savoy to Relieve Nice in 1705. By Captain Cristiani, Infantry. *Rivista Militare Italiana*, Jan, '16. 4000 words.]

(Of historical interest only. The author concludes there was no such expedition.)

**—Military Policy of**

See also

EUROPEAN WAR—GENERAL NOTES ON OPERATIONS—SOUTHERN THEATER

NAVAL OPERATIONS—ATTACK

(Article: "The Failure to Capture Cattaro and the Dardanelles")

**JAPAN****—Army**

[Japan's Striking Power—China and the United States. *Jahrbücher, deutsche A. u. M.*, Apr, '15. 4600 words.]

The Japanese Secretary for Foreign Affairs, Komura, in a recent address before the Japanese Parliament, remarked that Japan, surrounded by great nations (China four hundred, Russia one hundred sixty, and the United States one hundred millions), must endeavor to reach, at an early date, a population of over one hundred millions. He intimated that the solution of the problem is to be sought in continental colonization, in an Asiatic continental program which would push the Japanese front toward Russia and China and therefore would demand a development of Japanese military strength; but he referred also to another program, one that emphasized the importance of Japanese naval strength and looked to the south, to the islands of the Pacific and to the American continent for a solution.

Having in view the attitude of Japan during the present war and the demands she is making upon China, the Japanese program appears to contemplate supremacy upon the Pacific and the continent of Asia, to be initiated by a Japanese protectorate over China. This raises a question as to whether the powers of the Triple Entente are disposed to permit Japan to give effect to her plans in Asia.

There has been danger of war between Japan and China since 1913. That war has not actually supervened has been due to financial reasons and to considerations touching the United States. Japan has been careful to make her demands upon China at a time when other great powers that are deeply interested are otherwise engaged, and has therefore placed herself in a favorable position to legalize through war with China what may thus far be characterized only as robbery. That the situation has caused great anxiety in British circles is evidenced by the hundreds

of telegrams of warning and appeal that have reached London from British Asia and from British commercial centers in Chinese territory.

England committed a capital error in forming an alliance with Japan, because the latter it naturally a rival of Great Britain and must be a menace to British power and interests in India and the southern Pacific. A British alliance with China would have strengthened the position of the English by interposing a strong China between India on the one hand and Russia and Japan, or both of them, on the other.

Whether the United States can intervene effectively to prevent Japan from establishing herself firmly upon Chinese territory remains to be seen.

In the matter of a modern army Japan has an enormous lead over China.

Though the peace strength of the army is commonly regarded as being about 250,000 men, Japan can actually put into the field at once first line troops numbering 580,000 men, with 1000 machine guns, 89,000 horses, 1500 field guns, 90 mountain guns and 480 heavy guns; and when the present national defense law shall have become fully effective, Japan will be able to command without delay 750,000 first line troops, an equal number of reserves, and some 150,000 territorials.

The regular army of the United States consists of 4900 officers and 87,250 enlisted men, organized into small regiments, and with a divisional organization existing mainly only upon paper. The plans respecting the militia have in view the ultimate formation of sixteen divisions, comprising 300,000 men; but at the present time the militia organizations are mere skeletons, comprising in 1913 only 122,000, of whom only 80,000 could be said to be even partially trained. Therefore the prospects for the proposed sixteen divisions are not bright. If the experience of the United States in the mobilization of the Second Division in Texas is to be taken as an indication of the military strength that may be developed under the present system, it is clear that in case of need the government of that country will be compelled to adopt other measures.

In the matter of land forces actually in being and ready for service when called, the strength of the United States is far behind that of Japan. A comparison of the naval strength of the United States with that of Japan indicates that the superiority of the former is still undeniable, though in the matter of the newest type of submarines the latter has somewhat of an advantage.

A conflict between the United States and Japan would necessarily have to be decided on land. The Philippines would be taken by Japan without difficulty. Would the final decision be sought upon Chinese, American or Japanese soil? In this connection it is to be borne in mind that the transportation of large bodies of troops from the land of the Rising Sun to the United States, or the reverse, or from the United States to China, and the safe-

guarding the line of communication and supply, demand the command of the sea.

#### —History

[Japanese Policy in China. By J. O. P. Bland. *Nineteenth Century*, Nov, '15. 7000 words.]

In considering the future of China, especially as conditioned by Japanese interests, it is a well-known fact that Europeans, particularly those that have lived in the Far East, are usually found on the side of the Chinese. After eliminating all sentimental reasons why this should be so, we are compelled to recognize the apprehension of those whose present and future place in the sun may be threatened by Japanese ambition and policy. The present war in Europe has undeniably given Japan an opportunity to consolidate her interests in those regions considered by her as a predestined heritage—Manchuria, Eastern Mongolia, and certain seacoast provinces of China proper. Her demands upon China last January became inevitable from the moment that country ceased to be able to maintain the *status quo* at Peking. Even if England had not called upon Japan to expel the Germans, Count Okuma would have been compelled to take his opportunity at the flood. The people demanded it.

The issues involved in Japan's recent maneuvers at Peking are much greater than appears from a cursory study of her demands. A new situation is created which, sooner or later, must be faced: economic and other interests will undergo regrouping as a result of the Japanese policy. For example, it is absurd to believe that Japan's sole object in attacking Germany in Shantung was to fulfill her treaty engagements and to preserve the peace of the Far East. Her foreign policy growing out of the character and need of her people is natural, inevitable, and perfectly legitimate; its purposes have been manifested with consistent clearness since the Treaty of Shimonoseki (1895); are plainly set forth in the history of Korea, in the terms of the Russo-Japanese *entente*, in the part played by Japan in the Chinese revolution of 1911, and now in the latest demands put forward at Peking. Its aim is national expansion, peaceful if possible, but, in any case, expansion. In pursuing this aim, the Japanese rulers know full well that in China and elsewhere in the Pacific their interests will conflict at certain points with British and other interests.

It is well, therefore, to consider what are the permanent objectives of Japan's expansionist policy, and to what extent they are imposed upon her rulers by the character and needs of the Japanese people.

Perry's guns taught the Japanese in a flash that Dai Nippon's days of splendid isolation were over, and that if Japan was to hold her own in a world of machinery and explosives, she must go to school and learn to beat the foreigner at his own game. To the example of disciplined patriotism shown by the Japanese under their self-imposed task of reorganization, history affords no parallel. They reaped their reward in 1894, when the startled West

**JAPAN—Continued**

awoke to the military genius of the Japanese and to the contemptible helplessness of the Chinese. How well Japan has drunk in the lesson of discipline appears from her self-restraint under the interference of Russia, Germany and France; another period of watchful waiting and preparation followed. But during the half-century of national reorganization, new economic conditions established themselves: a considerable proportion of the people passed from ancestral agriculture to modern industrialism. Hence the need of new markets, of new food supplies, and of new outlets for Japan's increasing millions. Checked after 1894, had Japan been debarred from Korea, Manchuria, and Eastern Mongolia, her fate would have been sealed. Saved by her victory over Russia (1904-5), Japan saw herself in control of China's fertile and thinly peopled regions north of the Great Wall.

The Portsmouth Treaty apparently gave Japan but scant reward for her costly effort; China seemed to be the chief beneficiary. But Japan has learned from the West something more than the art of modern warfare. She learned that treaties are, after all, nothing but paper, and has, at any rate, acted on the principle that the virtue of the State is security. Hence from the outset she has violated and is still violating the treaty that gave her so small a measure of the fruits of victory. The present condition of affairs in Europe has given her an opportunity to consolidate all the advantages over which she has struggled for the past thirty years. She is taking possession of China's outlying dependencies, and trying to establish the beginnings of overlordship in China proper, simply because the opportunity offered, and because she believes this course necessary to her security and future prosperity.

The Portsmouth Treaty at once became a dead letter because, under Prince Ito's advice, Japan set about pooling her interests with Russia. This she did because the problem of procuring food and finding elbow room for her rapidly increasing population was becoming increasingly acute.

The following table speaks for itself:

	Population.	Foreign Trade. £	Foodstuffs Imported. £
1875 . . . .	34,000,000	6,000,000	
1903 . . . .	46,305,000	62,000,000	6,700,000
1914 . . . .	53,700,000	110,000,000	10,300,000

Of Japan's total area, 148,756 square miles, less than one-fifth is cultivated land. Hence it is clear that Japan cannot support her increasing population from her own agricultural resources. The present excess of births over deaths is, roughly, 660,000 per annum; the ratio of urban to country inhabitants is about three to one, and the town populations tend to increase twice as fast as those of the country in former days. The situation of Japan resembles that of Great Britain, but without that country's reserve of wealth and colonies for emigration. Under these conditions, Japan must have an outlet, and finds it in the vast undeveloped resources of China's

northern dependencies and their eventual conversion into Japanese territory. Even without the European war, nothing remained to prevent the elimination of China's sovereignty over the vast regions in which Russia and Japan had effectively asserted their special rights and interests. But it is also true that this war has given Japan an opportunity to accomplish, without fear of interference, many of the ends toward which all the efforts of her soldiers and statesmen have been directed for the last thirty years. The demand for a strong policy in China has been steadily growing since 1895, and has been unmistakably expressed whenever the internal condition of China has created real or possible opportunities of successful fishing in troubled waters. Two voices are heard in the ultimatum handed in to the Chinese Foreign office in May, and to which China has yielded. One of these is the cry of a people taxed to the uttermost farthing, demanding more room and food for itself and for its posterity. The other is the voice of a racial pride and ambition, eager for the day of territorial aggrandizement which is to reward many long years of sacrifice and self-restraint. The terms of the agreement resulting from the ultimatum just mentioned recall the negotiations in respect of Korea in 1904. The "contingent demands" put forward by Japan in January, 1915, rejected by China, but not withdrawn by their author, are well worthy of serious consideration, for they arise not from economic necessity, but from political ambition, and the dream of a Far Eastern Empire that shall in time rival that of Great Britain, and dominate all the regions of the Pacific. Had China yielded to these demands she would have yielded with them the substance of her sovereignty and independence: for these demands clearly involved the establishment of a military and economic protectorate over all China. That Japan is resolved to establish this protectorate, there is no reasonable doubt. She will take advantage of the corruption and inefficiency of the Mandarins, and while consolidating her position in Manchuria by colonization and industrial activity, she will pursue her policy of peaceful penetration in central and southern China.

If Japan's dream of a great Asiatic Empire ever comes true, it will be when Japanese officers succeed in organizing and commanding Chinese troops. The raw material is there; if it can be trained in loyalty to Japanese leaders, success is assured; if not, failure will follow. But the Chinese are a peaceful race; given good government and justice, peace and security for life and property, it is to most of them a matter of indifference whether their rulers be Mongol or Manchu, Japanese or British. If Japan can confer such good government and establish such security, the benefit to civilization will be great; if she cannot, then will it be better for the future peace of mankind that Japan should confine herself to those thinly peopled regions in which and for which she defeated Russia.

*See also*

FAR EASTERN QUESTION  
RUSSO-JAPANESE WAR

—History—Relations with United States

See also

JAPAN—ARMY (Article: "Japan's Striking Power")

JAPANESE-RUSSIAN WAR

See

RUSSO-JAPANESE WAR

JENA, Battle of

[The Strategic Pursuit after Jena. By Major E. T. Compton. *United Service Magazine*, Apr, '16. 1600 words.]

(A historical article.)

JUTLAND, Battle of

[Battle of Jutland. *The Sphere*, June 10, '16. 400 words. Diagrams.]

(Shows the successive stages of the naval fight in the North Sea, May 31-June 1, with a short description of the maneuvers during the battle.)

[American Naval Criticisms. By Arthur Pollen. *Land and Water*, Sept 14, '16. 2200 words.]

(This article refers to a report made by land, addressed to the Secretary of the Navy. The writer summarizes Captain Sims' argument as being to the effect that as the British general command of the sea was complete enough for all purposes so long as the German fleet was contained, there was no need for the British fleet to have attempted to force a decisive action with the Germans on May 31. The writer holds that Captain Sims' views, though probably correct if judged by text-book standards, are wrong in that the German fleet came out obviously to raise German prestige and, hence, to improve the morale of the nation. It was thus clearly a military object of the highest importance to turn the German adventure into defeat, because by so doing German courage and resolution would be depressed more than the High Seas Fleet had ever hoped to raise it. A real and final destruction of the German fleet would have made certain further naval operations feasible which must have been of still more direct military importance. Finally, the economic results, the value of which are incalculable, would have followed a decisive victory.)

[The Battle of Jutland. By Arthur Pollen. *Land and Water*, June 8, 1916. 6000 words. 7 sketches.]

The Battle of Jutland must be regarded as by far the greatest event in the history of modern sea war. The opposing forces, exclusive of light cruisers, destroyers, submarines, etc., were:

British.

BEATTY: *Lion, Tiger, Queen Mary, Princess Royal, Indefatigable, New Zealand.*

THOMAS: *Barham, Valiant, Warspite, Malaya.*

JELlicoe: *A, B, and D Battle Squadrons.*

HOOD: *Invincible, Inflexible, Indomitable.*

ARBUTHNOT: *Defence, Warrior, Black Prince, Duke of Edinburgh.*

German.

VON HIPPER: *Hindenburg, Dörflinger, Lützow, Seydlitz, Moltke.*

VON SCHEER: 3 *Koenigs*, 5 *Kaisers*, 4 *Heligoland*s, 4 *Westphalens*, and 6 *Pre-Dreadnought*s.)

(Total: 16 dreadnoughts and 6 pre-dreadnoughts.)

The battle began in the early afternoon of May 31, 1916. The action was fought in misty weather in which contact between the two fleets was occasionally lost. The fighting therefore, was of an intermittent character.

From 3:45 p.m. until 4:45 p.m. the engagement was between battle cruisers only. By this time von Hipper had been driven back on to the High Seas Fleet and the British fast squadron, reinforced by four *Queen Elizabeth*s, fought a holding action for the next hour and a quarter, drawing the German High Seas Fleet towards the forces that were approaching under Admiral Jellicoe. During this phase the British squadron was greatly outnumbered by the Germans, but at 6 p.m., Rear-Admiral Hood arrived with three battle cruisers and at 6:20 p.m. the British were further reinforced by Rear-Admiral Sir Robert Arbuthnot with four armored cruisers of the *Defence* and *Duke of Edinburgh* classes.

Shortly after 6:30 p.m., Sir John Jellicoe brought the Grand Fleet on to the field of battle, upon which von Scheer retreated. From 7 p.m. until darkness fell, the bad light, the thick weather, and the retreat of the Germans made anything like an artillery duel between the two fleets impossible. The German destroyers did all in their power to hamper pursuit by the British dreadnoughts, and when pursuit by the capital ships was made impossible by darkness, the British destroyers were sent forward amongst the German ships. There then followed a night action, the pursuit being carried on by the British cruisers and destroyers until 3 a.m., when such of the German fleet as survived had reached the mine defences of their main base. The Commander-in-chief then recalled his fleet, and at daylight made a systematic search of the scene of the engagement, but without finding any disabled ships. At noon the British forces returned to their bases, refueled, and 24 hours later were once more ready for action.

The Germans, according to their own account, entered the North Sea to engage and destroy the British ships that have been systematically sweeping the waters north and east of the Horn Reef. They did attain the first part of their objective in that they succeeded in engaging. But the consequences were disastrous. The plan of overwhelming the British fast division with superior numbers was defeated by the masterly handling of the British force, combined with the effective use that force made of its artillery. Sir David Beatty succeeded admirably in his main object, which was to draw the German Fleet into position where Sir John Jellicoe's squadrons could engage it. The enemy was

**JUTLAND, Battle of—Continued**

saved from total destruction by mist, and by the approach of night.

The British losses in ships were: 3 battle cruisers, 3 armored cruisers, and 8 destroyers. Between 5000 and 6000 officers and men perished. The German losses were heavier. A very conservative estimate puts their loss at 4 capital ships, 4 cruisers, 9 destroyers, and one submarine, with other ships badly disabled.

[A detailed account of the battle, and comments on the result are given under the subtitles: The Disposition of the Opposing Fleets; The Opening Round; The Holding Action; The Heroic Hood; The Dash of the Cruisers; The Grand Fleet and the German Flight; The General Chase; The Leading of the B. G. F.; The Loss of the B. Cruisers; Sir Robert Arbuthnot's Self-Sacrifice; Destroyer Tactics; The Cost of Victory; The Worth of Victory; The News and its Reception.]

[The Battle of Jutland. By Arthur Pollen. *Land and Water*, June 15, '16. 2400 words. 1 diagram.]

It is highly probable that the German losses in this battle amount to six capital ships, seven cruisers, fifteen destroyers and at least three submarines. No estimate can be reliable, however, until all the evidence is thoroughly sifted and impartially compared. The above figures are suggested, not as definitely established German losses, but as indicating that there is evidence of much higher losses than the Admiralty has claimed.

The plan of action followed by the British Fleet was undoubtedly that formulated by the Commander-in-Chief. The task allotted to each section of the fleet was the result of past experience and a careful consideration of all the probabilities. The objective was to bring the enemy's fleet as a whole to action.

The *Indefatigable* was sunk within ten minutes of the time the battle cruisers opened fire on von Hipper's squadron. The action continued in a south-easterly and southerly direction for an hour after this, and then our fast division led the Germans northwards for another hour and twenty minutes, when, after the entry of Hood and Arbuthnot into the field the way was clear for the Grand Fleet, and the action ended with the flight of the enemy. With reference to the effect of shell fire, it is astonishing that the battle cruisers should have received such severe punishment with such insignificant injuries. One hears of a ship receiving over fifty hits of 11 and 12-inch shell without losing a knot of speed, one-tenth of her complement, or having one-quarter of her guns out of action.

The spirit of the Fleet was at its highest, and those who knew the Navy best have been least surprised at the triumphant egress of all from this ordeal.

[The Battle of Jutland. By Edward Foord. Supplement to the *Sphere*, July 15, '16. 3000 words. Map and diagram.]

(This supplement presents an excellent account of the battle of Jutland, with a statement of forces engaged. The movements of the fleets and the relative positions are indicated in the diagram. The account is based upon the official despatches as published in the *London Gazette* of July 6.)

[Jutland, Battle of. *Information*, July, '16. Quoted.]

What has already been termed the greatest naval battle in history was fought May 31 near the Skagerrak off the west of Jutland (Denmark). The first report issued by Germany, June 2, claimed the victory, but subsequent statements by the British admiralty declared the German loss was actually as well as relatively the greater, and there is no question that the English fleet forced the German to flee to its base.

The admitted German losses in the Jutland battle were:

Dreadnought battle cruiser—*Lützow*.

Battleship—*Pommern*.

Cruisers—*Wiesbaden*, *Elbing*, *Frauenlob* and *Kostock*.

Torpedo craft—Five.

The losses admitted by the British admiralty were:

Dreadnought battle cruisers—*Queen Mary*, *Indefatigable* and *Invincible*.

Cruisers—*Warrior*, *Black Prince* and *Defense*.

Torpedo craft—Eight, i. e., the *Tipperary*, *Ardent*, *Fortune*, *Shark*, *Sparrow Hawk*, *Nesstor*, *Nomad* and *Turbulent*.

Statistics giving the tonnage and armament of the larger ships sunk will be found under their own names.

The battle in which great armored dreadnoughts came to grips for the first time in the history of the world was fought in hazy weather, in which a ship could not be made out at more than six miles' distance. The details were as follows:

During an enterprise directed to the northward, the German High Seas Fleet, under the personal command of Vice-Admiral Reinhardt Scheer, encountered the ships of the British Grand Fleet engaged in making one of their periodical sweeps through the North Sea. The British fleet was divided into two parts—a smaller force under Sir David Beatty, and the other, the battle fleet or main body, under the commander-in-chief, Sir John Jellicoe. This distribution of the ships was the dominating factor in bringing about the battle. Had the whole British fleet been massed and close together it is more than likely that no battle would have occurred. With the British fleet divided, the Germans were encouraged to give battle with Beatty. Sir David, determined to get them into a fight, arranged to draw them nearer Jellicoe's main body, which he knew to be coming up in support. The main body came up in time to take a decisive part in the battle, and was for more than two hours in action. The whole battle lasted five hours.

The battle cruiser fleet under Vice-Adm.



Beatty, comprising the first and second battle cruiser squadron, the first, second and third light cruiser squadrons, and destroyers from the first, ninth, tenth and thirteenth flotillas, and supported by ships of the fifth battle squadron (four battleships of the *Queen Elizabeth* class) under Rear-Adm. Evans-Thomas was scouting to the southward of the battle fleet under Sir John Jellicoe, which was accompanied by the third battle cruiser squadron, the first and second cruiser squadrons, the fourth light cruiser squadron, and the fourth, eleventh and twelfth flotillas.

The *Galatea* first reported the presence of German vessels at 2.20 o'clock in the afternoon. A German force of five battle cruisers was sighted at 3.30 o'clock. Vice-Adm. Beatty's first and third light cruiser squadrons spread eastward, forming a screen in advance of Adm. Evans-Thomas' battle cruiser squadron, which came up at high speed. Both forces opened fire simultaneously at 3.48 at a range of 18,500 yards. Two submarines being sighted, a flotilla of 10 destroyers was ordered to attack. They intercepted a German force of light cruisers and fifteen destroyers, forcing them to retire, leaving two destroyers sunk. The *Nestor*, *Nomad* and *Minotaur* pressed the attack on the German battle cruisers, and the two former were badly hit. From 4.15 to 4.43 a fierce conflict raged between the battle cruisers, the third German ship was seen to be on fire, the German battle fleet was reported ahead, and the destroyers were recalled. Adm. Beatty then altered his course to lead the Germans to the British battle fleet, which was sighted at 5.56 o'clock.

Vice-Adm. Jellicoe formed the line of battle at 6.15 o'clock, Vice-Adm. Beatty meantime having formed the battle cruisers ahead of the battle fleet, and the fleets became engaged. During the deployment the *Defense* and *Warrior* were seen passing between the British and German fleets under heavy fire. The *Defense* disappeared and the *Warrior* passed to the rear, disabled.

The third battle cruiser squadron, under Rear-Adm. Horace Alexander Hood, was in advance of the battle fleet and was ordered to reinforce Vice-Adm. Beatty. While en route the *Chester*, Captain Lawson, engaged three or four German light cruisers for twenty minutes. Despite many casualties, her steaming qualities were unimpaired.

The action between the main battle fleets lasted, intermittently, from 6.17 to 8.20 o'clock at ranges between 9000 and 12,000 yards. The Germans constantly turned away and opened the range under the cover of destroyer attacks and smoke screens as the effect of the British fire was felt, and alterations of the course from southeast by east to west in an endeavor to close up brought the British battle fleet, which commenced action in an advantageous position on the Germans' bow, to a quartering bearing from the German battle line, and placed Vice-Adm. Jellicoe between the Germans and their bases.

The visibility improved at sunset at 7.17, when Beatty re-engaged, and destroyers at the head of the German line emitted volumes

of gray smoke, covering their capital ships as with a pall, under cover of which they turned away and disappeared. At 7.45, the light cruiser squadrons, sweeping westward, located two German battleships and cruisers. At 8.20 Vice-Adm. Beatty heavily engaged them at 10,000 yards. The leading ship, being repeatedly hit by the *Lion*, turned away in flames, with a heavy list. The *Princess Royal* set fire to a three-funneled battleship. The *New Zealand* and *Indomitable* reported that the ship they engaged left the line heeling over and afire. At 8.40, the battle cruisers felt a heavy shock as if struck by a mine or torpedo. This was assumed to be a vessel blowing up.

The *Marlborough* was hit by a torpedo at 6.54 p. m. and took a considerable list to starboard, but reopened fire at 7.03 at a cruiser. At 7.12 she fired fourteen rapid salvos at a cruiser of the *Koenig* class, hitting her frequently until she left the line.

During the action the range decreased to 5000 yards. The first battle squadron received more of the enemy's fire than the remainder of the fleet, excepting the fifth squadron. The *Colossus* was hit, but not seriously.

The fourth squadron, led by the flagship *Iron Duke*, engaged a squadron consisting of the *Koenig* and *Kaiser* classes, with battle cruisers and light cruisers. The British fire was effective, although a mist rendered range-taking difficult. The *Iron Duke* fired on a battleship of the *Koenig* class at 12,000 yards. The hitting commenced at the second salvo, and only ceased when the target turned away.

The second squadron under Adm. Jerram engaged vessels of the *Kaiser*, or *Koenig*, classes and also a battle cruiser, which apparently was severely damaged. A squadron under the command of Rear-Adm. Heath, with the cruiser *Duke of Edinburgh*, acted as a connecting link between the battle fleet and the battle cruiser fleet, but did not get into action.

The German vessels were entirely out of the fight at 9 o'clock.

The British heavy ships were not attacked during the night, but three British destroyer flotillas delivered a series of gallant and successful attacks, causing heavy losses. The fourth flotilla, under Captain Wintour, suffered severe losses, including the *Tipperary*. The twelfth flotilla, under Captain Stirling, attacked a squadron of six large vessels of the *Kaiser* class, taking it by surprise and firing many torpedoes. The second, third, and fourth ships in the line were hit and the third blew up. The destroyers were under a heavy fire of German light cruisers. Only the *Onslaught* received material injuries. The *Castor* sank a German destroyer at point-blank range.

The thirteenth flotilla, under Captain Farie, was stationed astern of the battle fleet. A large vessel crossed in the rear of the flotilla after midnight at high speed. Turning on her searchlights, she fired heavily on the *Petard* and the *Turbulent*, and the latter was disabled. The *Champion* was engaged for a few minutes with four German destroyers, while the *Moresby* fired a torpedo at a ship of the

**JUTLAND, Battle of—Continued**

*Deutschland* class and felt an explosion.

At daylight on the first of June, the British battle fleet, being southward of Horn Reef, turned northward in search of the enemy vessels. The waters from the latitude of Horn Reef to the scene of action were thoroughly searched and some survivors from the destroyers *Ardent*, *Fortune* and *Tipperary* were picked up. The *Sparrow Hawk*, which had been in collision, was no longer seaworthy and was sunk after the crew was taken off.

The cruiser squadron was detached to search for the *Warrior*, which had been abandoned while in tow of the *Engadine* on the way to the base, owing to bad weather setting in and the vessel becoming unseaworthy. No trace of her was discovered, and further subsequent search by the light cruiser squadron having failed to locate her, it was evident she had foundered.

The fleet was fueled, replenished its ammunition, and at 9.30 p. m., on the second of June, was reported ready for further action.

A total of 333 British officers were killed in the Jutland battle, according to a list issued by the Admiralty June 5. This list showed that practically all the officers of the cruisers *Queen Mary*, *Invincible*, *Indefatigable*, *Defense*, and *Black Prince*, and from the destroyers *Tipperary*, *Turbulent*, *Fortune*, *Ardent*, *Nomad*, *Nestor*, and *Shark* perished. All the officers except one from the cruiser *Warrior* were saved, and all the officers from the destroyer *Sparrow Hawk*. On the other ships, twenty-three officers were killed and twenty-two wounded. A complete list appeared in the New York *Herald* for June 21 and included:

Rear-Adm. Sir Robert K. Arbuthnot, of the *Defense*; Rear-Adm. the Hon. Horace L. A. Hood, of the *Invincible*; Capt. Charles F. Sowerby, of the *Indefatigable*; Capt. Cecil I. Prowse, of the *Queen Mary*; Capt. Arthur L. Cay, of the *Invincible*; Capt. Thomas P. Bonham, of the *Black Prince*; Capt. Charles J. Wintour, of the *Tipperary*; and Capt. Stanley B. Ellis, of the *Defense*.

The Germans placed the British loss at 15 ships. The British placed the German loss at 18 ships, 113,435 tons, while Adm. Jellicoe enumerated 21 German vessels as probably lost.

[German Official Story of the Skagerrak Sea Fight. *Scientific American*, Aug 19, '16. 3000 words. Diagrams.]

(This account is based upon the German official accounts, and gives a graphic description of the action, with diagrams showing the positions and courses of vessels at various stages of the battle.)

**—Dirigibles in**

[The New Naval Arm. By T. R. Macmechen, Aeronautic Society of America. *Aero World*, Aug 16, '16. 2640 words.]

A new naval arm, the Zeppelin, was introduced into the great sea fight between the Germans and the British, and it gave the former a distinct advantage. The Zeppelins enabled the German fleet to ambush a part of the British fleet, and later upon the arrival

of the British fleet, to fire upon them through the fog without being seen themselves.

The German airships have reported the whereabouts and composition of the British fleet regularly, and the British, not knowing the whereabouts of the German fleet, have been at a great disadvantage. The Zeppelins have a range of vision of 90 miles, so they can see a ship at least three hours before it arrives at a certain point. This permits the German fleet, acting on information received from the Zeppelin, always to remain out of sight of the British. Thus an admiral in the Zeppelin can see so much more than from the ship and take advantages of all opportunities. The fight has shown the battle cruiser to be obsolete as a scout. The Germans, guided by the Zeppelins and using mist and smoke banks as a screen, saw the divided British fleet and dictated the course of battle. Hence it was that the British fleet arrived after the damage was done.

The smoke banks increase due to the firing of the guns and are opaque from the sea, but transparent from above in the air. In the future it will be necessary to have dirigibles to direct the fire from the big guns on land as well as on the sea. Seaplanes will serve for reconnoitering land from the sea but are of no use in a sea fight. It is significant fact no mention was made of seaplanes in the reports of the big sea fight.

**KAUSOLIT**

[New Swedish Explosive for Shells. *Arms and the Man*, Dec 2, '15.]

"For many years a superphosphate company in Stockholm has been experimenting with new explosives, and now seems to have found one warranting extensive manufacture. It is very powerful, and one of the principal ingredients is perchloride of ammonia, prepared in some special way. 'Kausolit,' as it is called, has great explosive power and seems especially adapted for shells.

A new factory at Trollhattan is expected to be finished early next year. Only chlorate will be manufactured there. It is estimated that the yearly production will amount to about 1300 tons. At the old factory, at Mansbo, the annual production is about 1900 to 2000 tons, and plans are being made for enlarging this factory."

**KITCHENS, Military**

—Field

[A New Rolling Kitchen. *The National Guard Magazine*, Dec, '15. 600 words. Entire article quoted.]

"A new type of rolling kitchen, built expressly for the first ambulance company, Indiana National Guard, and tried by the company on a trial march from Frankfort, where the company is located, to Indianapolis, is said to have proven very efficient. The fact that the company covered the distance (86 miles) in less than four days in good condition is ascribed entirely to the success of this kitchen.

"The kitchen itself is built upon a plan entirely different from those in common use.

The weight of the wagon, loaded with rations for two days, is 1900 pounds, or about 200 pounds less than an empty escort wagon. The bed, which measures nine and one-half by four and one-half feet, contains two fireless cookers under the driver's seat. Back of the seat, with an air space of six inches, is the Donavin type field-range, on a base of reinforced concrete one and one-half inches thick. Just to the rear of the stove the floor drops twelve inches, making the top of the stove the proper height for the cook. A space the width of the wagon and two feet deep is left for the cook to work in while the rear is a cabinet almost three feet wide, 30 inches high and 50 inches long for holding supplies. The top of this cabinet also serves as a work table. On the left-hand side is a 30-gallon water can, while on the right is a step for entering the wagon. To the rear the bed extends out one foot, giving a ledge on which to carry wood, etc. The top is a tent fly, which may be used as shelter on each side of the wagon by placing poles at the corners.

In addition to the wagon's light weight and corresponding ability to cover large distances, it affords a ready means for prompt and efficient service in preparing the meals. On the trial march, in all but one instance, regular full meals were served from it three times each day. In the morning, after stables, the men marched past it and were given their food. At noon and in the evening an hour before the halt was made, the wagon drove past the column, issuing the food to each driver as he sat on his wagon seat. He was, in this way, able to eat and watch his animals at the same time. The mess outfits were later collected by an orderly and washed by the cook. Here is a sample of a meal which was cooked while the rolling kitchen was keeping up with the column: Boiled potatoes, stewed tomatoes, scrambled eggs, coffee, bread and syrup. The following is a morning meal prepared by the fireless cooker: Coffee, rice, beef-stew and bread."

[How to Take Care of a Rolling Kitchen. By Ramón Louis Méndez. *Memorial del Ejército de Chile*, Dec 1, '15. 700 words.]

The valuable services rendered in the last maneuvers by the rolling kitchens show how indispensable they would be in campaign. Especially in this country where there are such poor roads, is it necessary that they be in perfect repair.

The overhauling should be done piece by piece in the regiment to which the kitchen belongs. Special attention must be paid to cleaning the bottoms of the compartments and the valves; the latter especially suffer from rust, and from the travel over poor roads. Meat and coffee grinders must be cleaned and freed from rust. Bolts, springs, and screws which are damaged must be replaced. A most complete overhauling of fire boxes is necessary so there will be no loss of steam.

The parts once cleaned must be given a bath in oxide of iron, and those parts that

are in contact with dirt, water and fire, should be painted a greenish grey.

[Army Items. *Army & Navy Jour.*, May 20, '16. 150 words.]

The War Department has contracted for 25 rolling kitchens to be tried out on the border and in Mexico. These kitchens are two-wheeled and drawn by two mules. The 71st Regt. N. G. N. Y. has been using for five years a rolling kitchen designed by Capt. True. It has proven satisfactory under severe conditions.

#### KITE BALLOONS

[Hundreds of Kite Balloons in the European War. By Ralph H. Upson. *Flying*, May, '16. 750 words. Ten illustrations.]

Kite balloons are now used almost everywhere in Europe. Fifteen years ago they were used extensively by Germany, but by no other country. They were turned down by the British when the Germans were using them with the greatest success. The French were just taking them up, having up to that time put their faith in spherical captive balloons. The kite balloons operate in any weather conditions that are likely to be met up to a thirty-mile wind. They are used for spotting artillery fire and for observation from points about three miles behind the lines. They are used in the Navy as well as the Army. On account of their keeping their head into the wind, they are very easy to operate. There are about 1000 of them in use by the Allies.

#### KNIVES

See also

INFANTRY—ARMS—KNIVES

#### KUT-EL-AMARA, Battle of

[The Fall of Kut-el-Amara. *Sphere*, May 6, '16. 1200 words. Illustrated.]

In Nov, 1915, Gen. Townshend started from the advanced base at Kut-el-Amara to advance on Bagdad. It has been stated in Parliament that this was ordered by Sir John Nixon, commander-in-chief in Mesopotamia. It is reported that Gen. Townshend protested. It is certain that the force was too weak and its supply services woefully inadequate. The possibility of strong Turkish operations against this force had not been fully considered.

After the capture of Kut-el-Amara, a long delay occurred while supplies and reinforcements were being brought up. This delay has been criticised, but it was doubtless necessary. It now appears that the Turks decided to hold Bagdad, and took such measures of concentration as to make certain of Gen. Townshend's defeat. Marshal von der Goltz concentrated troops north of Bagdad as a safeguard against a Russian advance on Erzerum. As this move did not materialize, he threw everything against Gen. Townshend.

The force covering Bagdad was attacked by the British on Nov 22 at Ctesiphon. Although the British occupied the field of battle, they lost over 4500 men, or 30 per cent. of the effective force. Von der Goltz's army was at hand, and Gen. Townshend's bolt was shot. He

**KUT-EL-AMARA—Continued**

could only retreat, encumbered by a huge convoy of wounded. The retreat was made with great difficulty and some loss of baggage, but the bulk of the force reached Kut-el-Amara Dec 3. The place is almost surrounded by the Tigris and easy to defend, but equally easy to blockade. It would perhaps have been better to march on, but there were many difficulties of transport, and wounded and stores would have had to be abandoned. There were stores at Kut-el-Amara, and it perhaps seemed little likely that the force would be starved out. Gen. Townshend had to decide on the spot, and he decided to stay.

The Turks attacked and were repeatedly repulsed, but by the end of the year the British had 1500 casualties. The Turks settled down to a blockade, and as the months wore on and supplies dwindled, the situation became desperate. Attempts at relief failed. Gen. Goringe's relief column was impeded by floods, and he was defeated at Sanna-i-yat on Apr 23. An attempt was made to send a boatload of provisions into Kut-el-Amara, but the boat stranded. On Apr 27 (apparently), Gen. Townshend surrendered.

The loss of this division is a disaster, but it can have no final effect in a war in which Great Britain has 5,000,000 troops under arms.

[Kut-el-Amara and After. By Lieut.-Col. A. C. Yate. *United Service Magazine*, June, '16. 5200 words.]

In the second week of Sept, 1915, Major-General Townshend's 6th Division, consisting of the 16th, 17th, and 18th Brigades, with the 30th Brigade of the 12th Division attached, and with the usual complement of cavalry, artillery, and sappers, was assembled at Iman-Ali-el-Gharbi on the Tigris. With it was a river flotilla mounting heavy guns. The force commenced its movement on the 12th of Sept towards Es-Sinn, the strongly fortified position 6 to 8 miles east of Kut-el-Amara, which the Turks were reported to have occupied and entrenched. They had in reality been fortifying it ever since the 7th of June, the date on which Sir John Nixon's force occupied Amara. General Townshend's Division reached Sanna-i-yat on the 16th of Sept., which lies 8 miles east of Es-Sinn, and encamped there to await the arrival of the larger guns, which were mounted on barges, and of the reserve supply of munitions and stores. This necessitated a halt of ten days. On the 26th of Sept the division moved 6 miles up river from Sanna-i-yat, the 16th and 17th Brigades marching on the right and the 18th on the left bank of the Tigris. Camp was pitched close to the river on the right bank, opposite Nakhailat, about 6 miles below and east of the Turkish position at Es-Sinn, the two parts of the British force communicating by a bridge of pontoons, which was at once thrown across the river. A portion of the bridge adjoining the left bank was left unfinished in order to delude the enemy. It was hastily completed after dark on the 27th to let the 16th and 17th Brigades pass to the left bank and start on their turning

movement. The 30th Brigade and the Sappers were evidently detailed to protect the camp and bridgehead on the right bank. These were fully 8000 yards distant from the Turkish positions.

The strength of the Turkish force occupying the Es-Sinn entrenchments was reported to be from 10,000 to 12,000 Turks and Arab Regulars, together with an unknown number of Arab Irregulars. Aeroplane reconnaissance had failed to throw further light on the enemy's numbers. The Turks seemingly took cover underground when aeroplanes were sighted. One British aeroplane was forced, owing to engine trouble, to descend and was captured. A good percentage of the Turkish troops at Es-Sinn had already suffered defeat at Kurna, Shaiba, and Nasiriyeh. If the morale of the enemy had thus been impaired, that of the British troops had not deteriorated, despite the many trials of Mesopotamian hot weather. The total strength of General Townshend's command was about 9000, and the spirit and physique of it are best judged after the account of the defeat of the Turks has been read.

On the 26th of Sept the 18th Brigade, under Brigadier-General Fry, disembarked on the left bank of the river, advanced a short distance and entrenched themselves. About midnight the Turks began shelling the camp; but, though the shells fell over it, very little damage was done. On the 27th the 18th continued its demonstration, pushing forward to within 3500 yards of the enemy, and again entrenching. On the right bank also a small force with guns was pushed forward. All the guns on naval boats and in barges on the river, at the bend between Chahela and Nakhailat, took part in the demonstration, which was intended to impress the Turkish General Nured-din with the belief that it was the prelude to the real attack which was about to be made on the right of the Turkish position. On the evening of the 27th, the 16th and 17th Brigades under General Delamain, crossing the boat-bridge, which had been hastily restored and strewn with scrub and mud to deaden sound, moved off on their long night march to turn the Turkish left flank. The 30th Brigade entrenched itself and remained to protect the camp and bridge-head. The force detailed for the turning movement (a tactical operation involving a night march right across the enemy's front, covered by the 18th Brigade) comprised the 2d Oxford and Bucks, L. I., a Battalion Dorset Regiment, 22d Punjabis and the 20th, 103d, 117th and 119th Infantry. Two miles north of the boat-bridge, at the S. E. corner of the Suwada Marsh, was Clerly's Post, where Colonel Clerly with the 104th Infantry was stationed. At that point the turning column, which will in future be called Column A, arrived at 9:30 p. m. on the 27th, and there it bivouacked till 1:30 a. m. on the 28th. At that hour the entire force, the 104th included, moved off northwestward to turn the Turkish left. It appears from subsequent events that the 2d line transport was assem-

bled at Clery's Post, where it could be under the care of its own escort and protected by Brigadier-General Fry's 18th Brigade. The Turkish position extended from N. W. to S. E., facing N. E. The length of its from right to left was about 11 miles, of which four miles was on the right or south bank of the Tigris, and seven on the left. Where the Tigris passed through the position, the passage was blocked by some form of obstruction. The defenses on the south bank consisted of a large redoubt on the extreme right, four miles from the river, the intervening distance being strongly entrenched. Behind the entrenchments the remains of a broad high level canal and of a dry water course afforded additional lines of defense. The seven-mile Turkish front north of the Tigris was thus split up:

Entrenchments with a front of three-quarters of a mile, and a depth of a mile, with gun emplacements; the Horseshoe Marsh three-quarters of a mile across; three-quarters of a mile of entrenchments with some guns, covered by wire entanglements; the Suwada Marsh one and one-half miles across and four miles in depth, water quite undrinkable; three and one-quarter miles of entrenchments between the Suwada Marsh and the "Circular Marsh," which lies to the west of the Suwechi Marsh, those entrenchments being protected by wire entanglements and comprising four or five redoubts and emplacements for guns and machine guns. The underground cover was so extensive that when the British aeroplanes first reconnoitered the position, on the 16th of September, they could make no estimate of the strength of the defending force.

Column A started at 1:30 a. m. on the 28th March from Clery's Post. It was upon the effective action of this column that depended the success of General Townshend's plan. The task allotted to the 18th Brigade was that of holding the Turkish troops between the Suwada Marsh and the Tigris in position by a vigorous demonstration against this front. In this task, the 18th Brigade would receive some support from the 30th, left to protect the brigade and camp. It is not known when the Turks perceived that a movement to turn their left flank was being made. Seeing that the British force 6000 strong and accompanied by Field Artillery, maxims, ammunition column, first-line transport, including carts, was moving right across the Turkish front at a distance of about 6000 yards, it is difficult to believe that sound from it in the night did not reach Turkish ears. It would depend on the wind and atmospheric conditions. It is not stated whether the Turks or the 18th Brigade kept up artillery fire during the night, but the Turkish left was surprised. The Turkish troops transferred from the right to the left bank would have to make a very considerable detour by the one bridge not far distant from Kut-el-Amara, before they could cross the Tigris. This denudation of the Turkish right-bank position, if carried out, should have set free the 30th Brigade to support the 18th in its frontal demon-

stration. [Here the article gives minute details of the attack that captured Kut-el-Amara.] The Turkish losses were very great, 1500 prisoners alone being taken. The British troops succeeded in reaching Azizieh, the main body being at Kut-el-Amara, and the Turks, retreating northward, had already evacuated their position covering Baghdad.

## LANDING OPERATIONS

[Notes on Combined naval and Military Operations. By "G." *United Service Mag.*, Aug., '15. 4000 words.]

I. *Signalling.* In landing operations, an efficient system of signalling is necessary if the fire of the covering ships is to be of material assistance. The signals must cover (a) signals to control fire of covering ships; (b) signals concerning boats; (c) signals covering disembarkation of troops and supplies; (d) general signals.

Covering fire must be opened immediately when asked for to be of assistance. Boat signals will be largely obviated by efficient organization, but with literally hundreds of boats in service, the organization must be perfect in detail. Boats may be towed as close shore as the towing boats can go and then cast off. At Gallipoli, available boats of each ship were divided into two tows, each having a capacity of 135-150 men. Machine guns and stretcher bearers were landed with the troops. To each lifeboat were detailed two boatkeepers and a coxswain; to other boats four boatkeepers and a coxswain. Two duplicate tows were supplied to each of the three battleships. The four tows of each ship could land a half battalion each trip.

Each tow was in command of an officer in the steamboat, and each boat was in charge of a midshipman. An officer should go with each tow to take charge when cast off. All the tows should be in general charge of one officer who is responsible for keeping direction. Detailed arrangements should be made for embarking in the boats to prevent confusion even in the dark. Careful organization is also necessary to get the best service from the boats in maintaining the troops on shore. (Details given.) Boats should be kept permanently at the same class of work, and not shifted to unfamiliar work.

II. *Boatwork.* Success in landing operations demands good boatwork. Operations at the Dardanelles have furnished much experience. In the landing at Gaba Tepe, the covering troops consisted of 1½ battalions. Three battleships were detailed to put the force ashore, boat equipment as above. In computing the capacity of a boat, it must be remembered that a soldier with full pack weighs a third more and takes up a half more room than without equipment. Ample space must be left for the oarsmen.

The type of signal normally used will be to order the boats to proceed to a certain ship or to shore, or a request for all available boats to handle wounded.

Signals concerning disembarkation of troops and supplies are not ordinarily so urgent,

**LANDING OPERATIONS—Continued**

though urgent calls for ammunition or special equipment must occasionally be sent. General signals cover all the ordinary messages, reports, casualty lists, etc. The system of signals must take cognizance not only of the character of messages to be sent, but also of the personnel and equipment for sending. The number of naval signallers and wireless operators is limited, as are also those of the army, and methods of procedure differ, not only between the army and navy, but also between the navy and merchant services. It is of first importance that every shore station be a combined army and navy station, no matter by which controlled or what equipment it has. The call for naval signallers will thus be heavy, and as the number is determined by needs on shipboard, embarrassment may result. The number of instruments available—flags, lanterns, telescopes, even to an extent portable wireless sets—can usually be augmented by improvisation on shipboard.

The ideal shore signal station is a combined army and navy station, capable of transmitting by all service methods, including wireless telegraphy, operating as a relay between the land stations and the ships. Preferably the flanking stations should be under military control, the base station under naval control. The flank stations should communicate directly with the firing line and with the base station. Different stations deal with different types of messages; flank stations with fire control and direction signals, the base station with other messages. All shore stations should have the same wave length, and the same as all ships assisting the troops by covering fire.

Signals controlling covering fire must be rapidly transmitted. Even so a minute will elapse before the spotting signal will reach the ship, but one shot a minute is too slow. A burst of fire is therefore spotted generally, and the next burst shifted accordingly. This provides for rapid fire and prevents waste of ammunition, the latter an important item for guns of large caliber and short life. Delay will occur by this method in first opening fire.

In employing wireless, the enemy may interfere, but his messages will result in detection. Jamming of signals by the enemy is serious, but this can usually be evaded.

Shore signal stations should be taken ashore and set up at the earliest practicable moment, at points where visual signals can be sent to ships. It is easier to move a signal station than a ship. A code expedites fire control signals, but in a code, a mistake of a single letter may entail serious consequences.

III. *Covering fire.* Covering fire may be directed at moving targets (troops), or at trenches, emplacements, guns, etc. Flat trajectory and difficulty of spotting make this fire relatively ineffective. Naval guns have been developed for use against ships, though few hits on a vulnerable target (deck) as against many hits on an invulnerable target (armor) might well be given further consideration and result in a gun better suited to

covering fire. Reduced charges give a less flat trajectory but result in delays which are objectionable when the fire is urgently needed. Ships under weigh can use any guns of their armament; those at anchor only those bearing, perhaps not the most suitable. Attempts have been made to mount howitzers on battleships, but the inaccuracy of a howitzer fired from an unsteady platform is too great.

Observation of fire may be by captive balloons, by aircraft, or by shore observers, the latter being most satisfactory if a good location can be secured. Good communication with the firing ship is essential. Fire at troops is spotted by five minute bursts; at fixed targets, it is spotted by rounds or salvos. High explosive shell is used at stationary targets. The possibilities of shrapnel for land use has occupied naval experts for four months past, and sometimes wholesale results are achieved by its use.

[Landing Operations, and the Value of Mobile Defense. By Lt.-Col. Marietti. *Rivista Militare Italiana*, Jan, '16.]

(The close of a continued article not reviewed in the DIGEST. The author concludes that the real and effective defense of the coasts resides in the war fleet; that as the objective of an army is the destruction of the enemy army, so that of a fleet is to destroy the adverse fleet. This done, the coast is safe.—Ed.)

**—Defense Against**

[War Game—XI. The Defense Against a Landing Body. By Lieut. Guido von Horvath. *Scientific American*, May 27, '16. 4200 words. Map.]

The primary defense of the coast is the Navy, and so long as this remains afloat, an enemy is not likely to attempt a landing. Such an operation, in the face of a defensive force, is one of the most difficult operations in war.

At the outbreak of war, a coast guard would be established to give warning of the approach or landing of an enemy, and thus permit the defensive elements to be brought into action. Observation for this purpose would be carried out by scout cruisers, aeroplanes, naval patrols and captive balloons.

Preparations for the defense of the coast line comprise the seacoast fortifications, and the arrangements for the rapid movement of troops to any threatened point.

(To illustrate the general principles of coast defense, a general situation is assumed based upon precedent and present naval operations, wherein is brought about a prospective landing operation. Necessary defensive arrangements are brought out.)

**LATIN-AMERICA****—Military Policy of**

[For the Security of America. By Lt.-Col. Rodolfo Pita. *Revista Militar* (Argentina), 9 July, '16. 1800 words.]

The nations of to-day were formed little by little by the grouping together of localities,

towns and provinces, not only distinct but at times actually hostile to one another. Thus France was formed of the Isle of France, Flanders, Brittany, Gascony, Provence, etc.

Germany and Italy are other examples of united nations composed of small political groups. In this way, first the family, then the town, then the nation successively have been created. The Latin-American States should unite in co-operation for the common good. The patriotism which should be cultivated should not be exclusive or aggressive, but international, a proper regard being held for the rights and liberties of others.

A close confederation of the Latin-American States, by serving as an example to the world, would lead towards the formation of a confederation of the entire human race. England first said to the people, "You are free"; France first said "You are sovereign". Let Latin-America be the first to say "You are brothers." At present, however, this is but an ideal to which men should aspire. To-day peace is maintained between nations only by reciprocal fear. A state which accepts disarmament simply writes its own death-warrant. War is a great evil, but it is not the greatest of all evils. National dignity or the defense of liberty may make war a necessity. Strong and well disciplined armies are indispensable to-day for the security of the South American republics.

#### LATRINES

##### —Field

[A Field Latrine. By W. D. *Infantry Jour.*, Nov, '15. Plates. 500 words.]

This latrine was evolved and used in El Paso by Company D, 6th Inf. The frame rested upon a shelf four inches below surface, so as to be flyproof. A section of back, covered by wire gauze, removed all odors. A sloping back prevented fouling. A hinged top allowed free and easy access for daily burning out. A six-inch belt at bottom of enclosure afforded ventilation. Then solid boards for two feet, and inclined open strips for four feet six inches, afforded light, air, and concealment, while keeping out a driving rain. The height afforded coolness to men standing, and is much superior to the low-roofed canvas affair in hot climates.

[A Latrine That is Different. By 1st Lieut. G. H. Osterhout, jr., U. S. M. C. *The Marine Corps Gazette*, Sept, '16. 1000 words.]

The following is a description of a latrine used by a detachment of Marines in Limonade, Haiti, which was highly satisfactory and endorsed by Navy and Marine Officers who saw it:

Two shallow, parallel trenches were dug five feet apart, each being 9 ft. x 2½ ft. on the surface and 8 ft. x 1½ ft. on the bottom, and two feet deep. Each trench was then filled to within 6 in. of the top with broken rock or stones 3 to 8 in. in diameter. Then in one of the trenches was placed a compact layer of straw about one foot deep. Over all was placed a movable box 7½ ft. x 2

ft. at the bottom, 7½ x 1½ ft. at the top and 2 ft. high, with holes cut through the top as seats. This box rested on 2 in. x 4 in. joists, one at each end of the trench. The space at one end not covered by the box was used as a urinal. A portable shelter, large enough to cover the box and to allow the men to pass in and out was provided. After being used as a latrine for one day the use of the first trench was discontinued and the second trench was covered with straw and the box and shelter moved to it. Then liquid refuse (dishwater) was poured in along the sides of the first trench and allowed to seep through the straw, which served to separate any solid matter from the liquid. Then solid refuse was placed on top, covered with another layer of straw and then a 2 foot pile of wood. Fire was then applied to the refuse-laden trench. Three or four hours are required to burn out the trench, one burning for each 24 hours. The incineration is good and unaccompanied by the usual odors. This latrine requires but little digging, is permanent and sanitary.

As described above, a command of 40 men can be cared for. If a larger one is desired only the length should be increased, for the depth given is believed to produce the best results.

#### LAW, Military

[Our Military Justice. Its Constitutional Source. By C. Risso Domingo. *Revista Militar*, July, 1916. 2600 words.]

Article 21 of the National Constitution determines the object of the armed forces to be the defense of the state and the Constitution. This article establishes the methods of governing the armed forces by laws enacted by Congress and decrees issued by the Executive.

The attributes invested in Congress and the President by the Constitution for the control of the Army and Navy are called *military powers*. They should not be confused with the *powers of war*. The latter are faculties conferred upon Congress to authorize the President to declare war and make peace.

Both the military powers and the powers of war are exercised solely by Congress and the President to the absolute exclusion of the judicial authorities. Because of its constitutional origin our military justice has no relation whatsoever with the judiciary. In reality, and under a constitutional aspect, it is not *justice* but *discipline*.

See also

AERONAUTICS—LEGAL REGULATION OF  
PROPERTY RIGHTS (IN WAR)

#### LIBYA

See also

ITALY—ARMY—LIBYAN TROOPS

#### LIEGE, Defense of

[Gen. Léman's Account of the Fall of Fort Loncin. By M. A. u. G. *Tidskrift i Fortifikation*, parts 5 and 6. '15. 1000 words.]

The defender of Liège, Lieutenant General Léman, made some interesting notes about

**LIEGE, Defense of—Continued**

the bombardment and assault of Fort Loncin that are not only valuable as aids to a knowledge of the effects of the German artillery, but are also of great psychological interest, as they come from a man who with admirable heroism endured to the last in the fortress while it was being destroyed by shell fire.

The bombardment began August 11 with 10 and 15 c. m. guns; during the 12th and 13th also with 21 c. m. howitzers, but not until the 14th with the guns that laid the fortress in ruins. Gen. Léman has divided the final bombardment into four periods. The first began 4:15 p. m. the 14th and lasted two hours. After half an hour's pause, the fire from the 21 c. m. howitzer began and lasted all night, with very destructive effects. The third period began at 5:30 a. m. the 15th and continued until 2 p. m. It had very destructive effects, the poisonous gases from the exploding shells penetrating into the galleries and inner rooms.

The fourth period, which ended with the fall of Fort Loncin, Gen. Léman has described as follows: "At 2 p. m., the bombardment began again with a violence that one cannot imagine. It appeared as if the German batteries fired salvos. Later, we ascertained that they fired with a 42 c. m. mortar, using shells weighing 1000 kg. with a hitherto unsuspected explosive effect. We heard them as they approached; we heard the whistle in the air that gradually increased to the roar of a raging hurricane and ended with a frightful thunderclap; unheard of dust and smoke clouds whirled over the trembling ground. At a certain time during this terrible bombardment I wished to return to the commanding officer's room to ascertain what was happening there, but hardly had I taken a couple of steps out in the gallery when a very violent blast of air passed through the corridor and knocked me down. I arose and was about to proceed, but was held back by a stream of suffocating air that enveloped everything. It was a mixture of gases of explosion and smoke from a fire that had broken out in the men's quarters where beds and furniture were found.

We were, therefore, driven back to the room from which we had come, but the air there could no longer be breathed. We were nearly suffocated when Captain Collard (the General's adjutant) thought of taking out the upper part of the window guard and thus obtaining a little air through this opening.

As I wished to try to bring a part of the garrison in security, I said to those with me that I would go to the counterscarp. They then helped me through the intervening rooms out into the moat (ditch) which I started to pass over, but to my dismay I saw that the fort had collapsed and that its debris filled the moat, forming a dam that extended from the scarp to the counterscarp. Soldiers were running back and forth on this dam, and I assumed that they were Belgian gendarmes and called to them: Gendarmes! but an attack of suffocation overcame me and I fell

senseless to the earth. When I returned to consciousness, I saw myself surrounded by my companions who attempted to assist me; but among my people there was a German captain who gave me some water to drink. This happened about 6:30 p. m. (as I afterward learned). I was laid in an ambulance and taken to Liège. I was a prisoner without having surrendered.

Afterward I ascertained that Fort Loncin, about 4:20 p. m., had blown up, just as I was thrown to the ground by the blast of gas and smoke in the gallery; that the men that I had taken to be Belgian gendarmes were German soldiers who had taken advantage of the dam to pass over the moat; and that the German pioneers had orders to rescue those of the garrison who were still alive.

On my return to Liège, I was interned in the provisional governor's castle together with Capt. Collard and my servant. The German general, Kolewe, the military governor of the city, handed me, in the presence of Capt. Collard and the German major, B., who acted as the palace adjutant, a sabre as a token of esteem. I have this weapon here in my room in Magdeburg citadel."

**LIGHTHOUSES**

*See also*

**AERONAUTICS—LIGHTHOUSES AND BEACONS**

**LINES OF COMMUNICATION**

[Lines of Communication. By N. Sbishnekov. *Voenny Sbornik*, May, '16. 4000 words.]

This article considers only lines of communication immediately in rear of the front, and which serve to unite the troops with their division and corps trains, field bakeries, artillery parks, etc. According to circumstances these lines, according to capacity, consist of:

- Ordinary railroads;
- Narrow-gauge railroads;
- Field railroads, utilizing animal traction;
- Metalled roads;
- Other roads.

For obvious reasons, railroads utilizing mechanical traction cannot ordinary be employed so close to the front as to be subject to the fire of hostile artillery; but in special situations, where this can be done, they should, of course, be used to their full capacity.

Field railroads, having a narrow gauge, and using horse traction as a rule, can be and are much used in the immediate rear of the battle line. Such lines can be easily laid down and do not need any complicated construction or equipment; they should lead to standard railroads. But the most important lines of communication are undoubtedly metal roads, notwithstanding that their construction requires time, men and considerable quantities of sand, stone, etc., and very considerable work and material for upkeep.

The remainder of the article gives data concerning the quantity of sand, rock, etc., needed for the upkeep of roads constructed in the field of operations.



[New Communications Needed on the Battlefield. (Reports from the Scene of Operations.) *La Guerra y su Preparación*, May, '16. 750 words.]

Without a good system of communication, it is admitted that a commanding officer in battle must resign himself to the rôle of passive spectator. Hence, the importance of this matter, in the modern battle. Generally, all units, down to the battalion, have adopted the telephone for communication with one another and with the various headquarters. For smaller units, optical signals have been called upon.

Reports of recent experience are unanimous, however, in declaring that a really efficacious and rapid means of communication, especially in combat at close quarters and in the offense, is to-day lacking. The modern attack is prepared by violent artillery fire, and by the launching of projectiles that on bursting give off heavy clouds of smoke. The assaulting troops are thus frequently cut off by a curtain of gases, making all optical means useless. Sir Ian Hamilton reports officially that on Gallipoli the English columns, after breaking the enemy lines, fell under the allied artillery fire, because at a distance friends could not be distinguished from foes, and there was no system by which the infantry could correct the fatal error. The same thing has occurred elsewhere. Neither on the offense nor on the defense has the telephone always answered. If the cables lie on the ground they are destroyed by artillery fire; they have to be continually repaired, which becomes impossible when this fire increases in intensity before an attack, that is, at the moment when communication is essential. If to escape artillery fire the cables are buried, then much time is necessary, repairs are difficult, and mobility is impaired. Moreover, in attacks and in withdrawals, one cannot have recourse to a method that implies a certain degree of permanency. In position warfare, and in attacks limited to trench elements, to combats between small units, the telephone is satisfactory, but it fails in the critical moments of a vigorous attack.

#### M. F. P. AEROPLANE

[The M. F. P. Steel War Plane. *Aerial Age Weekly*, Apr 3, '16. 1350 words. Five illustrations.]

The new M. F. P. steel war plane has a span of 45 feet, length of 26 feet 6 inches, 410 square feet of surface, and a weight of a little over 1200 pounds. Consequently it is a very fast machine and an exceedingly rapid climber. Seamless steel tube is used in the place of wood. The fuselage is stream lined and has the seats so arranged that both pilot and passenger have an unobstructed view. The motor is a 160 h.p. Hall-Scott and can be started from the seat. The planes are one piece construction with the latest approved Eiffel section. As the landing chassis consists of only two U frames with stream line cross section, air resistance is reduced to a minimum. The disc wheels, mounted on a

single axle, are secured to the chassis by rubber shock absorbers. The controls are double wired throughout. Three different types of machines can be made by attaching different sized wings to the same fuselage.

#### MACHINE GUNS

[The Machine Gun and Its Development. *Arms and the Man*, Dec 2, '15. 2200 words.]

So far, the Germans have proved themselves masters of both the French and the English in the art of making for to-day the weapons of to-morrow. Ever ready to discard old theories for the new, their belief in the machine gun has become so firm that they have practically discarded the rifle.

This is a shock, of course, to military tradition, and it is difficult to conceive of soldiers going into battle without the sloping rifles and gleaming bayonets. Yet it has been shown that one machine gun, properly placed, can hold a battalion.

The machine gun, in competent hands, is very accurate. Tests have shown that one gun will make more hits than 50 marksmen, and, since there are rarely more than 50 marksmen in a regiment, it may be said that, as a target hitter, a machine gun is equal to a regiment.

To trace the development of this very effective weapon, we must go back to the year 1382, when there were put in the field at Ghent 200 *chars de canon*, artillery pieces consisting of a number of barrels mounted on two-wheeled carriages, garnished with pikes and scythe blades. Louis XII had a piece of this type which fired 50 shots at one round.

There are two other primitive types of machine gun of about this period. One was in use in Italy and was a weapon of four barrels. It was fired from the back of a donkey. The other was the *ribaudequein Chinois*, which, though first brought to light when captured by the French in 1860, is believed to have been produced about the beginning of the 14th century. It consisted of four iron barrels, 9 feet long, mounted on a truck. The barrels were stationary and were fired simultaneously. The piece was probably used for firing at close ranges.

The next of the earlier types of machine guns was a Danish one of 9 barrels, mounted in sets of three. About the same time there was produced in America a bronze revolving cannon which fired three shots in rapid succession. This gun was very popular in the War of 1812, and probably was responsible for some of our naval victories.

No satisfactory machine gun was found until breech-loading was invented. In 1860, Richard Gatling produced a breech-loading gun of ten barrels which revolved about an axis and were fired in turn as the revolving mechanism brought them into position, the cartridges being fed from a drum. This gun had a long range and was used very effectively in the Civil and Spanish wars, but had the grave disadvantages of great weight, liability to frequent jams and the necessity of operating the breech mechanism by hand. Other guns followed rapidly, the Reffye, weighing 2710 pounds; the Requa battery, an artillery

**MACHINE GUNS—Continued**

type tried by the United States navy; the Hotchkiss, the Gardner, and the Nordenfeldt, all having the disadvantage of being hand-operated.

The first of the modern automatically operated machine guns was that invented by Hiram Maxim and adopted by the British government in 1889. In 1854, an American, Henry Bessemer, had patented the system of using the gases of explosion for working the breech mechanism, but Maxim's was the first automatic gun of practical value.

The Maxim gun now used by the English and the Germans, is water-cooled. The force of the recoil opens the breech, ejects the cartridge case and expands a spring, which, when released, takes a new shell from the cartridge belts, places it in the chamber and closes the breech.

The gun is light, weighing 50 to 60 pounds, and fires from 450 to 600 rounds per minute. The cartridges are loaded from a belt containing 250 rounds. Its chief fault seems to lie in the steam which rises from the boiling water in the jacket and discloses the position of the gun.

The Hotchkiss type, adopted by the French army, has its breech and firing mechanism under the barrel. When the gun is fired the gas of explosion drives back a piston in the cylinder tube. A lug on the piston compresses a spring, which, when the trigger is pulled, drives the piston back again. This reciprocating motion of the piston, continuous as long as the trigger is held, performs all the processes of loading and firing. Cartridges are fed from feeding strips containing 50 rounds each.

The gun is a simple one, easily repaired, weighs only 53 pounds, and fires 500 to 600 rounds per minute. It is air-cooled.

The Colt automatic gun is similar in operation to the Hotchkiss. An additional feature is that air is compressed by the piston and blown through the barrel after each shot, cleaning out unconsumed powder and assisting in cooling the piece. The gun weighs 40 pounds, fires 100 shots per minute, and is easily portable.

There is no doubt that the present war's contribution to the science of warfare will be in the direction of the development of the machine gun. The Germans started the war with 50,000 machine guns and now have a much greater number. They are holding their long line with a small number of men armed with these guns, and their infantry is only brought up in emergencies. The guns are protected by steel plates and can only be put out of action by a direct hit with a high explosive shell.

Both the French and the English have established machine gun schools, and officers and men in training are showing the keenest interest in the new form of warfare which the gun has introduced.

It is to be hoped that our National Guard will soon realize the importance of these weapons and will be equipped with them and properly drilled in their use.

[Machine Guns. By Lieut. Col. J. C. De K. Bruce-Kingsmill, R.F.A. *Journal of the United Service Institution of India*, Jan, '16. 9000 words.]

A machine gun should be able to fire about 400 rounds per minute without loss of accuracy, to accompany the other arms anywhere, and to come into action quickly at rifle range. Its mount should be rigid and permit aiming and firing from kneeling, sitting, and prone positions. Gun and mount should present a small target and be light enough to be carried or dragged by one or two men. The gun should be simple, strong, and durable, and be able to open fire in less than 30 seconds. Mobility, constant readiness for action, lightness, and smallness of target are essential factors.

The fire effect of a machine gun is equal to that of at least fifty rifles; its mobility about the same as that of cavalry; its visibility that of a file of infantry; its vulnerability is unaffected by 50% of loss. Pack transportation is preferred. There is reason to doubt the utility of having machine guns at all if they are not commanded and handled by experts.

The mechanism of the Maxim is somewhat complicated and delicate, but no more so than any other piece of modern machinery. It is far less complicated and certainly far less delicate than the motor car. Both require highly trained operators to insure smooth and continuous working. Each individual machine, whether gun or motor, has its own peculiarities and requires special study to obtain the best results.

As the gun is generally required to move and to come into action independently of the other arms, it should have its own scouts.

With tripod mount and pack transport, a machine gun section should comprise one officer, one sergeant, two corporals and 24 privates, i. e., 1 n.c.o. and 12 men per gun.

The Germans, who have studied machine guns far more thoroughly than anyone else, have made them a separate arm under trained, permanent gunners, as they evidently consider that none but specialists can attain the necessary efficiency.

An increase in machine guns must mean a greater economy of infantry and a greater diminution of casualties. The ideal of one machine gun to every twelve fighting men is not apt to be reached for the present, but it is urgently necessary that we should at once provide:

- (a) Two guns per squadron and one per company with two additional sections per regiment and per battalion;
- (b) Three or four batteries (each four guns) to every brigade in addition to those mentioned under (a);
- (c) Six to eight batteries to every cavalry division;
- (d) Twelve to fourteen batteries to every division;

Moreover, machine guns should be attached to the artillery and a large reserve of such guns should be kept on hand.

The latest German machine guns are of three types:

- (a) Model, weighing 21 lbs.
- (b) Experimental, weighing 23 lbs. (air-cooled);
- (c) Service, weighing 25 lbs. (water-cooled).

Three men form the gun squad. The gunner carries the gun and kodak tripod in front and the box of spare parts behind, the entire load being balanced; the others carry 500 rounds of ammunition each.

The German water-cooled gun fires 700 rounds per minute, carries about 20% more ammunition than we do, and has a maximum range of 2500 yards. The Germans have 12 and we have 2 of these guns per battalion.

The Germans do much night firing, sweeping the roads up to a range of 2500 yards when they expect our transport to be moving. We have not enough guns to do this.

German cavalry uses these guns in profusion. A few troopers gallop up and without dismounting blaze away at us from the chest, or they halt, unpack and fire in about 25 seconds.

Every man in a German machine gun company is an expert with the gun, and the gun is considered to be worth about fifty men.

Machine guns have played a very important part in the war and the Germans are adepts in making use of their surprise effect, which has been found to be very great. Machine guns play havoc with troops in close order, but once located, they are easily silenced by artillery or concentrated rifle fire. Positions for machine guns should be selected with care and occupied without attracting attention. Fire should be reserved until a suitable opportunity occurs to take full advantage of surprise effect. The only safeguard against surprise effect of hostile machine guns is careful reconnaissance.

The German gun when resting on the ground is about the height of a prone man; raised, that of one kneeling. A spectator saw fifty of these guns loaded into small two-wheeled carts and motor trucks, the operation taking less than 35 minutes. As the vehicles passed through a town, no one would have suspected the presence of machine guns. The machine gun is sometimes carried like a stretcher on the shoulders of bearers, which at a distance look like litter bearers carrying wounded from the field. The Germans also use two-wheeled carts fitted to carry three machine guns, two men being assigned to each gun. The driver and another man ride on the seat, and each cart is accompanied by a mounted n.c.o. or subaltern. Machine gun men march light, their knapsacks, etc., being carried in the carts. Mounted men carry rope and harness, so that their horses can be used for draft purposes. These carts with their bundles of equipment, etc., would not attract the slightest attention. The guns at the bottom are absolutely hidden.

Motor vans carry nine guns in a shallow false bottom, which is so carefully concealed that some of these lorries were actually cap-

tured and lost without the guns having been discovered by the captors. In many cases machine gun detachments of 15 or 16 men were carried in one of these vans. The mobility of guns so carried is of course obvious.

As the guns are small, they can easily be buried wrapped in a blanket. Many have actually been found buried, a wooden cross bearing a distinguishing mark indicating the spot.

The Germans use their machine guns with boldness and cleverness in attack, pushing them close up to the hostile trenches, and sometimes using them to prepare the infantry attack. They are often used in conjunction with snipers or in large numbers against one or both flanks of the position to be attacked. They usually cross their fire, which makes them difficult to locate. One attack was carried out solely by machine guns. The hostile trench was engaged from a flank by six or seven machine guns while other guns succeeded in working around and enfilading the position.

The range is usually obtained by bursts of fire as soon as a suitable position has been occupied, after which the Germans content themselves with preventing the defenders from showing their heads, thus enabling their own troops to approach in security. The closer the guns approach, the more oblique becomes their fire. The duration and volume of their fire depend upon the ground over which the advance is to be made, but they are careful to husband their ammunition, ammunition supply being their chief difficulty.

When the advance of their own infantry has passed the machine guns, the Germans try to place them in positions whence they can assail the enemy as he retires, or from which, in the event of a counter-attack, they can cover the withdrawal of their own infantry.

At Gallipoli, the beach was apparently deserted, when suddenly from nowhere came a raking fire of machine guns that wiped out our (British) people. A machine gun can be hidden where nothing else can.

Machine guns can escort and support artillery better than any other arm, and a section of such guns might well be attached to each battery, being subject to the orders of the battery commander.

One or two machine guns should be carried by every aeroplane charged with the duty of destroying hostile aircraft and with the attack of troops on the ground.

Machine guns are invaluable in completing the demoralization of a beaten army. Co-operating with pursuing cavalry and horse artillery, it should be well-nigh impossible for the fleeing enemy to reform. We have tried on our aeroplanes a Rivers-Vickers gun which is air-cooled and weighs about 27 lbs. Our water-cooled gun appears to be ill-adapted for air-fighting. After firing about 2000 rounds, the steam haze obscures the front sight.

See also

AERIAL ARTILLERY

**MACHINE GUNS—Continued****United States**

[Note. *Army & Navy Jour.*, Dec 18, '15. 100 words.]

A contract has been let by the War Department for 125 Vickers machine guns of a new type selected by a board of officers after a competitive test including four other makes. Estimates sent to Congress are understood to provide 250 more.

[Our Machine Guns. Editorial. *Army & Navy Jour.*, Mar 18, '16. 800 words.]

Mishaps with our machine guns, such as reported at Columbus, N. M., may be expected so long as they are handled by men not thoroughly trained to their use. The British have established machine gun schools behind the lines in France. We should provide similar instruction.

No entirely satisfactory machine gun has yet been developed. These weapons are machines operating under difficult conditions, and their infirmities do not nullify their effectiveness for such time as they can be kept working.

The Benét-Mercier gun was adopted as the result of exhaustive competitive tests. A later competitive test resulted in the adoption of a new design of Vickers-Maxim, but the board took occasion to say that the Benét-Mercier was the best in existence at the time of its adoption. Owing to the European War, it has been impossible to secure a supply of Vickers-Maxim guns, but orders have been placed in this country and the guns will be forthcoming shortly. Many favorable reports have been made on the Benét-Mercier, the latest from the Haytian Expeditionary force.

**Russia**

[Russian Machine-gun Matériel. By J. Nyberg. *Artilleri-Tidskrift* (Sweden), parts 1 and 2, 1915. 1100 words. 6 illustrations.]

The machine gun lately adopted by Russia is of the new Vickers model and is now manufactured in Russia (Tula). It has the same caliber as the Russian infantry rifle (7.62 mm.) and is sighted for 425-1850 meters.

It was found more difficult to decide upon a satisfactory carriage for this gun, as in the war with Japan they used two types of carriage, one with large wheels and a shield and another a tripod without either wheels or shield, and neither had proved satisfactory.

It was finally decided, after many experiments, to adopt a tripod carriage with two small wheels fastened to the two front legs of the tripod and with a small detachable shield (the Sákolv carriage) of Russian design and construction. This carriage, with the gun mounted on it, can be pulled or pushed like a wheel barrow, or, without being dismounted, transported on a pack saddle. Sights are provided for it so that it can be sighted without exposing the gunner.

A cylindrical vessel is designed for carrying the ammunition which is provided with an axle so that it can be rolled over the ground by pulling it by means of straps attached to

the axle. The illustrations show: (1) The gunner sitting on the seat provided, aiming and firing the gun. (2) Moving the gun on its two wheels, like pulling a wheel-barrow. (3) An open ammunition cylinder with contents and other ammunition boxes, etc. (4) A soldier creeping and dragging the ammunition cylinder. (5) A pack horse loaded with a machine gun complete on the saddle and on one side an ammunition box and a case with reserve gun barrels, on the other side a case containing spare parts for the gun. (6) A pack-horse loaded with a filled cylinder on the saddle and two ammunition boxes on each side.

**—Anti-Aircraft Firing**

See also

**SMALL ARMS—ANTI-AIRCRAFT FIRING****—Fire**

[Machine Guns. By Lieut. Col. J. M. Argañaras. *Rev. del Círculo Militar*, Sept, '15. 3000 words. 1 table.]

Machine gun fire differs in many points from rifle fire. Thanks to the stability of the support, it is influenced much less by the nervousness of the operator, and this admits of greater precision. On the other hand, it suffers from the unfavorable influence of excessive heating.

Although most machine guns can attain a rate of fire of 600 rounds per minute, this extreme rate has been used only under exceptional circumstances. In practice a rate of from 250 to 300 rounds per minute produces the best results. Three kinds of fire are to be distinguished:

*Fixed fire*, in which the arm is solidly fixed and fires on a very reduced front.

*Sweeping fire*, which permits the covering of a large front or the following of moving objectives.

*Mixed fire*, which consists in firing a number of rounds upon a determined part of the objective, displacing the fire from left to right methodically, then from right to left, etc.

The machine gun is above all an arm for medium and short ranges. It should not be used at ranges greater than from 1500 to 1600 meters. At greater distances its effect will be uncertain and insignificant. The depth of the beaten zone varies for the French machine gun, in fixed fire, from 226 meters at 600 meters range, to 90 meters at 1600.

**—Matériel****United States**

[Note. *Army & Navy Jour.*, Mar 25, '16. 200 words.]

The C. O. machine gun troop, 13th Cavalry, reports that the jamming of the machine guns was not due to failure of the mechanism to function properly, but due to the fact that it is difficult to load the guns in the dark. If the strip containing the cartridges is not inserted in the slot properly, the gun will fire about five shots and then jam. Two of the four guns were thus jammed.

[The Machine Rifle Board. Editorial *Army & Navy Jour.*, Oct 7, '16. 900 words.]

A board has been appointed by the War

Department to determine the machine gun question, and is now holding daily sessions in Washington. All branches of the service are represented on the board. This board is ordered to "consider and make recommendation as to whether a single type or more than one type of machine rifle, using small-arms ammunition, is needed for the service and the type or types which should be procured; and if more than one type, the proportion of the different types." The board is also to consider the procurement of machine guns or rifles in case of emergency requiring early delivery. Congress has appropriated \$12,000,000 for the purchase of machine rifles.

#### —Motor-Cycle Transport of

[Army Ordnance Notes. *Army & Navy Register*, Apr 29, '16. 200 words.]

Motorcycle equipment for two machine-gun sections was recently ordered. After it is received and tested under field conditions, the matter of ordering additional equipment of this kind will be determined. Each section will be furnished two motorcycles with side cars, each carrying a machine gun; two motorcycles with side cars for ammunition, and one motorcycle without side car for the commanding officer.

#### —Motor Transport of

[Note. *Army & Navy Jour.*, Sept 9, '16. 200 words.]

A large consignment of light motor trucks fitted to mount machine guns has arrived at San Antonio. Even the lightest guns will thus be given much greater mobility.

#### —Troops—Instruction and Training

[German Machine Gun Instruction. *Army & Navy Jour.*, Sept 9, '16. 500 words.]

In Germany, thorough instruction is given to the machine-gun personnel. A marksman's section is employed to occupy captured trenches and other tactical points of special importance. The machine gunners are taken from this section. Men chosen for machine gun companies must be good mechanics and of superior physique.

The course of special instruction lasts one month and includes thorough instruction in the mechanism and range firing at fixed and moving targets up to 800 meters. The men also learn signaling, entrenching, and the handling of captured guns. The Germans regard the Lewis gun as excellent, its only fault being the limited number of rounds that can be fired without recharging.

The machine gun company is the thirteenth company in each infantry regiment. It normally has six guns in action and one in reserve. A machine gun section has three guns in action, one and sometimes two in reserve. Separate machine gun companies are also organized. There are a total of four officers and 14 men to a gun, but there are some variations from this. The guns are transported on a small cart drawn by two men, and are carried to the firing line by the men.

#### —Organization

[The New Machine Gun Corps. *The Army and Navy Gazette*, Oct 30, 1915. 375 words.]

We are to form a regular machine gun corps, divided into three branches,—cavalry of the line, infantry of the line, and the recently formed motor machine gun service. The cavalry and infantry branches are to be organized as brigade machine gun squadrons or companies, while the motor machine gun service will be organized as motor machine gun batteries. So far the establishment of a machine gun company only has been laid down. For the present there seems to be no intention of interfering with the machine guns already in charge of cavalry regiments and infantry battalions, which will remain on a regimental basis and not form a part of the machine gun corps. Benefit to our fighting efficiency will result from our brigade commander having machine guns immediately at his own disposal, since it is obvious that the occasions must be rare when he can withdraw regimental machine guns already in action with their corps.

#### —Service Regulations

##### France

[The French Regulations for Infantry Machine Gun Platoons, July 19, 1912. By Major-General von Balck. *Jahrbücher, deutsche A. u. M.*, Apr, '15. 2600 words.]

Three machine gun platoons form a part of each regiment of French infantry. The complement of the three platoons includes 3 officers, 15 non-commissioned officers, 72 privates, 6 guns, 27 pack animals, 12 draft animals, and 3 wagons.

In order to avoid premature exposure to hostile fire the platoon advances under cover to a position for unpacking, from which the guns, after being prepared for action, are carried forward to a position in readiness. Great care in reconnoitering and taking up the firing position is enjoined, in order that the position of the guns may not be disclosed.

The regulations recognize four methods of fire: *distributed fire*, the normal method, which calls for sweeping the designated target from flank to flank with 100 rounds once or twice; *continuous fire*, in which the fire continues until interrupted by the command to cease firing; *intermittent fire*, being continuous fire interrupted from time to time by the chief of piece as the target disappears momentarily; and *unit fire*, which is delivered by using the gun substantially as a rifle, thus simulating rifle fire and preventing the premature disclosure of the presence of a machine gun.

Normally only one of the two guns of the platoon is fired. Firing with both guns at the same time is exceptional and is justified only against a particularly threatening portion of the hostile force; that is, against a deep, broad and only momentarily visible target.

One to two hundred rounds per minute is regarded as slow fire; and over 300 rounds

**MACHINE GUNS—Continued**

per minute, to be employed only in exceptional cases, is regarded as rapid fire.

As an error of 50 meters in estimating the distance of the target at long or middle ranges may render the fire without value, and as an observation of hits is not always to be relied upon, the range in a searching fire beyond 600 meters is extended gradually without interrupting the fire. In this way the target may be swept three times at three different ranges, varying from each other by only 50 meters.

If observation of hits is not possible, or the results of such observation uncertain, the platoon commander estimates the distance and sweeps the front of the target twice at each range selected.

At short ranges against cavalry entirely in view the elevation is 600 meters and the aiming point is the lower line of the target. Against infantry it is advisable to employ an elevation slightly greater than the one corresponding to the estimated distance. In estimating distances the platoon commander must take into consideration the change that will take place in the position of the target between the observation and the opening of the fire.

Against movable targets the rate of fire should be medium. If both guns are to fire at the same time, the platoon commander determines whether they shall employ the same elevation or two differing from each other by 50, 100, or even 200 meters.

Machine guns are a valuable aid to infantry engaged at close ranges. They are to be regarded as a movable fire reserve. In order that they may be concentrated at the time and place at which fire superiority becomes essential, they should not be put into action prematurely.

The machine gun is valuable mainly at short and mid ranges, and becomes especially effective when it may be used in enfilading a line or in rolling up a flank. Its value is comparatively small against a target of little depth or a line with great intervals.

Machine guns are placed to the best advantage immediately in rear of a flank or in rear of intervals in the most advanced line. To fire over infantry or other troops by way of supporting them is to be thought of only when the terrain renders possible two or more lines of fire, one above the other.

**—Sights for**

[Machine Gun Sights. By J. H. Doe, 2d Lt., 11th Inf. *Infantry Journal*, Feb, '16. 600 words.]

The present machine gun sight is ineffective. It does not permit of accurate long range firing. Accurate indirect fire is not possible with the present telescopic, nor with the open sight. A panoramic sight should be adopted without delay. In addition to solving the above problems, it will facilitate night firing and location of targets by day; it will aid in fire direction and in distribution or concentration of fire. Two panoramic sights make a fair

range finder, and any pair of machine guns would, therefore, always be equipped.

**—Tactics**

[Tactical Use of Machine-guns. By Second Lieutenant J. A. Cairone. *Rev. del Circulo Militar*, Aug, '15. 2500 words.]

The efficient use of machine guns hinges on the ease with which they are placed in action.

Practical experience shows that, when used for horizontal sweeping fire, the depth of the zone covered is very small compared with fire of infantry. When used over an irregular and broken field, more pieces at different heights of site should be used.

Against infantry, it is expedient to avoid the use of machine guns against thin or well covered skirmish lines. They should be kept with the reserves and used at decisive moments. They may be employed when, by means of their crushing fire, it is desired to hold the enemy in position. The moral effect of their fire will often assist in the advance of our troops.

They take no part in assaults, but are kept in position in previously determined points, firing especially on the enemy's reinforcements, etc.

Machine guns are of slight use in the line of skirmishers.

In retreat, covering positions will be held primarily by machine guns. In this case they will be protected by cavalry.

Against artillery in position the effect of machine-gun fire is nil.

Machine guns are always useful in moments when surprise is intended. They permit a rapid utilization of terrain, or quick taking advantage of changes in the situation.

**—Troops—Organization***Chile*

[Notes on the Tentative Drill Regulations for Machine Gun Troops. By Capt. José María Barcelo. Cazadores Regiment. *Mem. del Ejército* (Chile). 3350 words.]

The writer gives at first a brief historical sketch covering the earlier uses of machine guns and the organization of units. For infantry, he recommends the six-gun company, subdivided into three platoons. Each platoon would be the skeleton for further expansion so as to attach a machine gun company to each battalion of the regiment. For cavalry, the four-gun troop is recommended. (A Japanese report on the use of machine guns with cavalry, recommends the same number.)

In the Chilean Army, each machine gun troop is composed of four guns. The complement assigned to each gun includes one chief of section and nine privates, or 36 per troop. In addition there are horseholders, range finding men and the captain's orderly. Each gun section has three horses and 3000 rounds. In the ammunition section, 24,000 rounds are carried on 12 horses, so that each machine gun has an allowance of 9000 rounds.

A summary follows of the general principles contained in the new tentative regulations, a literal translation of the German regulations.

### Germany

[Machine Guns. Germany. By the (Spanish) Military Attaché at Berlin. *La Guerra y su Preparación*, Madrid, July, '16. 475 words.]

No. 13 Company of each regiment of Infantry, and No. 5 Company of each battalion of Jägers are armed with machine guns. Each has six pieces with limbers, drawn by two horses, and three two-horse ammunition carts. These form the combat echelon. The company has besides, four led horses, four spare horses, one four-horse spare wagon, and one two-horse traveling kitchen, one two-horse equipment wagon, and one four-horse forage wagon. Personnel, horses, and wagons foot up 96 men, 40 horses, 12 wagons; each piece is served by one chief and four men. The company ammunition supply is 81,000 rounds, 9000 rounds per wagon. The re-supply of ammunition belongs to the infantry ammunition columns of the division.

The mounted machine gun sections accompany as a rule, the cavalry division. Each section has six four-horse pieces with limber, and three four-horse ammunition wagons, which form the combat echelon. The field baggage train is composed of one large four-horse ammunition wagon, one four-horse spare wagon, five led and six spare horses. The baggage train consists of one two-horse equipment wagon, one two-horse ration wagon, and one two-horse forage wagon. The section thus has 130 men, 90 horses, and 14 wagons. Each gun-wagon carries 10,500 rounds; each munition wagon 8100, with a reserve in the large wagon; the light columns of the cavalry divisions attend to the re-supply.

### —United States

See also

FIELD ARTILLERY — MATERIEL — UNITED STATES  
(Article: "Our Deficiency in Artillery.")

### —Use of in European War

[The Development of Machine Guns. *Army & Navy Jour.* Dec 11, '15. 700 words.]

"The chief function of the early machine guns was that of repelling the attacks of the new torpedo craft. Very quick and accurate training and elevating were therefore necessary, and consequently heavy, slowly-moving guns were inadmissible. It was necessary that one man should be capable of pointing the gun quickly, so that guns of large caliber to fire heavy shell were ruled out, and small shell were ineffective. For these reasons the employment of shell fell into disuse for the machine guns, and single shots ranging from those of rifle caliber to about four pounds in weight were adopted, chiefly those from one pound to one and one-half pounds.

"An idea of the importance attained by the machine gun in the present war is conveyed by the formation, under Royal Warrant, of a new branch of the British service to be known as the machine gun corps and to be divided into three sections: cavalry of the line; infantry of the line, and motor machine

gun service. A machine gun record office will be established later. The war establishment of a machine gun company (headquarters and four sections each of four guns) will consist of headquarters, one officer, one warrant officer, two staff sergeants, two artificers, and twenty-six rank and file; unattached, two Royal Army Medical Corps men; and the four sections, eight officers, eight sergeants and 100 rank and file. This makes a total of 150 officers and men to a machine gun company. Each of the nine officers will be mounted, and in addition there will be forty-three draught horses and four bicycles.

"The Germans have made a special study of the mechanics and of the tactics of the machine gun; they introduced a very light model of the weapon and entrusted the handling of it to experts. They have employed machine guns to enfilade their first line trenches, have used them in concealment in rear and well to the front in the firing line; while in the offensive-defensive the guns have been used to produce the fire effect of large reinforcements at critical moments. 'It is, perhaps, not overstating the case,' says the *Gazette* (London), 'to say that while we hold our trenches with Infantry, the Germans hold theirs with guns and Maxims, so that while their ordinary daily wastage is less, comparatively, than ours, they are able to transfer their infantry, without excessive risk, and to reinforce threatened or weakened sections of their line. We have of late greatly augmented the number of our machine guns with our troops, and are supplying better and lighter models; we are doing much to increase the mechanical and tactical skill of our machine gunners; we may remember that the machine gun is, after all, a weapon rather of defense than of offense, and that from the time when the present siege warfare comes to an end much of the war value of the machine gun will have fallen away from it.'

See also

ATTACK—FRONTAL

(Article: "How May the German Front be Pierced?")

### MAPS AND MAPPING

[General Staff Maps. Importance of Military Maps in Modern Warfare. By Lieut. Guido von Horvath. *Scientific American*, Feb 26, '16. 2200 words. Illustrated.]

(Preparatory to a simple set of war game exercises, which it is proposed to publish, a popular article on the subject of the importance of maps and map reading is presented. This article points out the use of contours, hachures, and conventional signs and shows that by such means a large amount of data can be recorded in a small space. A small section of map is interpreted as an illustration. The article does not go beyond the most elementary consideration of the subject. The author was connected for two years with the Military Geographical Institute of Vienna (a branch of the General Staff), and later had topographical experience in Persia and South America.)

## MAPS AND MAPPING—Continued

[Topographic Mapping and National Defense. Note. *Scientific American*, Apr 8, '16. 200 words.]

The relatively slow progress of topographic surveying and mapping in this country is serious from a military point of view. Maps may be of the utmost importance. To the close of the last fiscal year, only 40.2 per cent. of the area of the United States had been mapped. Twenty thousand five hundred and eight square miles were completed during the year. The work is done by the United States Geological Survey.

[National Defense—For Engineer and Contractor. By Maj. P. S. Bond, C.E., U. S. A. *Engineering Record*, Part 6. Military Reconnaissance, Map Making, and Surveying. Apr 8, '16. 3600 words. Four photos.]

The modern game of war, from the moves of the strategist down to the operations of a patrol, is played upon a map. Not only must the engineers be experts in this branch, but all officers must be able to read maps, and also to make them.

Accurate maps require time and skill to prepare. The preparation and collection of such maps is a work for peace time, and a necessity in any scheme of national defense. Much of the United States has not yet been accurately surveyed.

The scale of the maps is a matter of great importance. For strategical operations, maps from two miles to the inch up to 50 miles to the inch will be useful. Tactical operations require that a map show topographical details, without being too bulky; one inch to the mile is the best scale for general use. Road sketches will have a scale from 1 to 3 inches to the mile; position sketches from 3 to 6 inches to the mile.

When surveys can be executed under the cover of the first-line troops, the methods will not be dissimilar from those employed in time of peace; civilian surveyors may here be advantageously employed. At the front, however, quick results demand special methods. The military solution is a crude adaptation of the plane table method of surveying; the small "sketching board," about a foot square, mounted on a light tripod is oriented by means of a compass. A triangular ruler serves as an alidade. Distances are measured by pacing and counting with a tally, by a speedometer, by the time of a horse at a known gait, or similar device. In each case, the sketcher has constructed the necessary scale of paces, time, etc. Slopes are measured by means of a hand clinometer, or by sighting along the edge of the board itself, reading the slope by means of a plumb-line and the graduations on the lower edge. Absolute elevations may be checked by an aneroid barometer.

Having determined, by the methods outlined above, the true position and elevation of a number of points in the terrain, the procedure is to fill the intervening topography by eye, a

task which requires practiced judgment and skill, not only in sketching, but no less so in selecting the controlling points.

The map should, in general, exhibit all features of military importance. Woods, cultivation, descriptions of bridges, fords, lines of communication of all kinds, camp sites, crops and local resources, descriptions of towns,—there is hardly a local feature which may not be of military importance.

A competent sketcher can, in a day, map some 10 miles of road and the immediately adjacent country; or make a position sketch covering from  $\frac{1}{2}$  to 2 square miles. The "principal sketcher" lays out and supervises the work of several subordinates. Individual sketches are afterwards assembled and coordinated, pieced together, and often printed direct from the translucent vellum on which they are made. Engineer troops are supplied with an efficient and portable outfit for map reproduction; the favored method is by zincography (lithography from zinc plates).

Facility in map-reading, so essential to every officer and non-commissioned officer, can be acquired only by long practice. Many questions must often be decided from maps, though final dispositions will usually be decided on the ground. Visibility problems, although interesting, can seldom be solved with great precision from maps.

Photographs are a valuable accessory to maps, in helping to visualize a terrain, and in illustrating details. If taken from air craft at considerable altitudes they are in effect a form of map. Landscape sketches may be even more valuable than maps, for in them important features of the terrain may be emphasized.

See also

### SKETCHING

#### —Map Reading

[Map Reading. By Major G. N. Wyatt, R. A. *Jour. Royal Artillery*, Nov, '15. 2000 words. 2 diagrs.]

A few notes in amplification of *The Manual of Map Reading and Field Sketching*, 1912, may be of interest, in view of the importance of this subject in every phase of warfare. After mastering the signs, map reading is only a matter of observation and common sense, a fact which leads people to underestimate its difficulty and the need for continual practice.

When finding the way by road, it is important to consider the time factor in attempting to identify points of the road in advance, and not place sole reliance upon cross-roads or side roads, etc., which may have changed since the map was published. The speed may be obtained either from a speedometer or by rough calculation.

Correct description of roads and places is important. Distinction should be made between cross-roads and road forks. Places should be described by reference to some prominent object on the ground rather than by some feature characteristic of the map alone.

Orienting the map by pointing at the sun may lead to an error in direction of as much



as 7 or 8 degrees; therefore some prominent point as a church steeple or a straight piece of road should be sighted on.

When a point of the country has been identified on the map, time often will be saved by using it as a reference point in referring to others. Such points may be noted as so many degrees from it, or in line with it, or just to the right or left. A protractor will assist in laying off angles and measuring bearings on the map. On a small scale map many details are not shown, but much may be inferred from what is shown.

In night movements, practice is essential; and although it is not difficult to march by compass bearing, much assistance can be obtained by the ability to recognize a few stars in different parts of the heavens.

[Practical Map Reading. By "Bellfield." *Jour. Royal Artillery*, Jan, '16. 2500 words, illus.]

Now that large scale maps, such as 1:20,000 or 1:10,000, are used extensively by batteries in the field, map reading has become an important part of an officer's work. From the map lines of fire are obtained, aiming points picked out, the position of targets identified, and ranges obtained.

Three distinct elements must be considered with respect to any point on the ground that is to be identified on the map, viz.: (1) direction; (2) distance, and (3) shape of ground or relative height. It is not safe to decide on a point which appears to fulfill two of these conditions without examining as to the third.

#### 1. Direction

In measuring angles, a semi-circular celluloid protractor (Steward's) will be found useful and fairly accurate. If several points are to be identified in a given zone, a well defined, distant reference point must be selected and identified on the map. Using the protractor, measure the angle between the reference point and the object on the ground, then plot it off on the map.

#### 2. Distance

The approximate distance may be found in two ways:

1. By estimation.

2. By noting whether it is further off or closer than other points easily identified or already known.

As a rule the latter method will be the more satisfactory. The scale of the map should be kept clearly in mind when considering distances to objects.

#### 3. Shape of ground

This condition, though considered last, is not of least importance, since a careful study of the contours will fix the position of an object on the map with far more certainty than will an estimated distance. It sometimes helps to examine all the features surrounding an object and then draw a rough plan of what is expected to be found on the map.

Often a thick, well defined hedge indicates a road. What looks like a wood may be

only scattered trees. A low ridge or embankment may conceal a hedge, so the first hedge visible beyond may be the second hedge shown on the map.

Watch the smoke of a distant railway train, it not only helps to identify the line of the railroad, but may be useful as a reference point for other objects. Finally, even the good maps may have mistakes, usually in connection with the roads.

### MARCHES AND MARCHING

[Great Marches of the Argentine Army. By Major Juan Beverina. *Revista Militar* (Argentina), 9 July, '16. 7000 words.]

A study of the great marches made by the Argentine Army. To facilitate this study, the interval between the war of Independence and the present moment is divided into four periods. The first includes the operations of the armies during the war against Spain; the second, the operations of the revolutionary armies; the third, the operations of the armies in the war against Paraguay; and the fourth, the operations of the modern army.

The most notable of the marches described were the two made from Buenos Aires into upper Peru in 1810 and 1813, respectively, and the crossing of the Andes in 1816 by the army under General San Martin.

The distances actually marched are not given.

See also

FEET—CARE OF THE  
PENINSULAR WAR

[Article: "The March of Crawford's Light Brigade"]

SANITARY SERVICE

### MARNE, Battle of the

[Cavalry in the Battle of the Marne. From "La Victoire de la Marne," Gustave Babin, *L'Illustration*, Sept 11, '15. 20,000 words.]

#### FRENCH CAVALRY

6th Army (Maunoury) had with it 3 divisions of cavalry. British army, 1 division.

5th Army (Franchet d'Espérey)—1 corps of cavalry (4th, 8th and 10th divisions and a light brigade of the 2nd division); between the British army and the 5th army.

9th Army (Foch)—9th division of cavalry, near Mailly. This to stop a considerable gap between the 9th and 4th armies. This gap might have been costly to General Foch, if there had not been a corresponding space in the German lines—a fortunate chance.

4th Army (Langle de Cary). No cavalry mentioned.

3d Army (Sarrail)—7th division of cavalry. 1st and 2d Armies were in the Vosges and opposite the fortified region Metz-Thionville.

#### GERMAN CAVALRY

After their successes on the Sambre, the Germans had pursued their offensive. Their marching wing, the right, preceded and covered by cavalry corps, was advancing with rapidity.

1st Army (von Kluck)—1 corps of cavalry. This cavalry was between von Kluck's three right corps and his two left corps. The 5th

**MARNE, Battle of the—Continued**

cavalry division was to act with the right against the 6th French army while the Guard cavalry was to co-operate with the two left corps against the British expeditionary force.

*2d Army* (von Bülow)—1 corps of cavalry.

*3d Army* (von Hausen)—No cavalry mentioned.

*4th Army* (Duke Albrecht of Württemberg)—1 division of cavalry.

*5th Army* (Crown Prince)—1 division of cavalry.

***Operations of the 6th Army***

6th September. The order to pass to the offensive had been issued on the evening of the 4th September and the 5th had been occupied in taking up the positions indicated in the order. The 6th Army (1 corps of it) had a severe engagement with a German corps south of the Marne. On the 6th, some progress was made by the 6th Army.

7th September. General Maunoury planned to act on the left with the 61st reserve division, brought from Paris, and all his cavalry. However, it was not possible to execute this maneuver that day.

8th September. The cavalry, which was in rear of the left wing, was ordered to move to the left and then push to the eastward.

9th September. On the 9th, von Kluck decided to withdraw, influenced considerably by a report from General von Marwitz, commanding the cavalry corps that had been left to contain the offensive of the British south of the Marne. Von Kluck's right flank, too, was in great peril, and he was obliged to send a strong column of infantry, supported by artillery, towards Nanteuil-le-Haudouin to cover his retreat.

***British Army***

6th September. Von Kluck's left attacked the British on the morning of the 6th, but these attacks ceased about 10 o'clock, as von Kluck was obliged to recall the 2d corps to his aid. The English were able to advance, meeting little resistance, although important German forces were still south of the Marne, notably the 4th corps near Rebais.

7th September. The withdrawal of the 4th corps was covered by the cavalry of von Marwitz, occupying the Grand-Morin from Pommeuse to Chauffry. Von Marwitz did not know what had become of the 2d corps with which he had been co-operating the evening before. The English cavalry division sought to flank the enemy but, at the time the German cavalry, having crossed the Grand-Morin and the Petit-Morin, was grouped near La Ferté-sous-Jouarre, it had arrived east of Choisy only. (This appears on the map to be between 15 and 20 kilometers from their objective.—Ed.)

8th September. About 1 o'clock, the English aviators reported a general movement of retreat towards the north and northeast. The British pushed on towards the Marne. Skirmishers, moving forward in pursuit of the 2d cavalry division, overtook it as it was

about to go into bivouac and forced it to continue its retreat.

9th September. In the morning, the British 1st and 2d corps crossed the Marne below Château-Thierry, but the 3d corps was unable to cross at La Ferté-sous-Jouarre, because the bridges were down. General von Marwitz, commanding the German cavalry, tried in vain to check the English. Having been flanked out of his position on the line of the Petit-Morin, he announced at noon that he was going to try again to cut off the columns which were advancing towards Charly and Nanteuil-sur-Marne. His success did not correspond to his good intentions, and the engagement that he had, at 4 o'clock, with the British, on the front marked by the road from Lizy to Château-Thierry and which was most severe at Montreuil-aux-Lions, was not favorable to him. The retreat of the Germans was very rapid in the region of Jaignes, Mary, Lizy-sur-Ourcq, and Coulombs.

***5th Army***

6th September. The 5th Army, in echelon with its right in front, attacked in the general direction of Montmirail at dawn on the 6th of September, supported on the right by the 9th army and on the left by the cavalry corps. Esternay was taken during the night. On the left, the cavalry corps had checked a German offensive in the region of Courtacon.

7th September. In the morning, aviators reported numerous German columns in march towards the northeast and north: most of the 3d and the 9th corps were going to the aid of von Kluck's right. The effect of the unexpected attack on the Ourcq was commencing to be felt. Von Bülow's right was beating a retreat. The 1st German cavalry corps, reinforced by solid infantry supports left by the 4th and 9th corps, was to cover his withdrawal.

8th September. Montmirail taken.

9th September. The 5th Army continued its offensive towards the Marne. On its left, the cavalry corps, reinforced by an infantry brigade, was to march by Azy and north of the Marne to act on the flank of the enemy columns in retreat. The German rearguards, in full retreat, were pursued by the left corps. In the night, the 18th corps seized Château-Thierry and held the northern exit of the town. The enemy was carried away as if by an irresistible reflux. In vain the night before, General von Richthofen, with the cavalry of the 2d Army, which had not taken part in the battle, was commissioned to organize defensively the north bank of the Marne, from Chézy to Château-Thierry. He did not have the time. The violent combat near Montreuil-aux-Lions turned him away from his mission. On the evening of the 9th, the 18th corps was at Château-Thierry, the 3d near Montigny-les-Condé, the 1st northwest of Fromentières co-operating with the 10th, which had already been put at the disposal of General Foch commanding the 9th Army.

10th September. The cavalry corps, for which the 18th corps had opened a passage to the north of the Marne, moved towards

Oulchy-le-Château and la Fère-en-Tardenois, connected with the British army.

11th September. The 5th Army having arrived north of the Aisne, after having pivoted on its right and faced the northeast, ran into a desperate resistance. On the 14th, the cavalry corps, which, with the 18th corps and the group of reserve divisions, had passed onto the right bank of the Aisne, advanced as far as Sissonne. One of the cavalry divisions received the order to take in reverse the German troops which were fighting against the 18th corps on the plateau of Craonne. But the group of reserve divisions not having been able to maintain itself on the right bank of the Aisne, the cavalry corps, which, at this moment, had cut the right wing of the 2d German army from the rest of that army, feared that it would find itself isolated beyond the Aisne. The arrival of the 7th reserve corps, liberated by the fall of Maubeuge, dislodged the 18th corps from the extreme point of the plateau of Craonne. The tenacity and energy of General Maudhuy succeeded, however, in maintaining the 18th corps on the heights of the right bank of the Aisne.

#### *9th Army*

The 9th division of cavalry was at Mailly stopping the gap between the 9th and 4th armies.

The intention of the commander-in-chief was that the 9th Army should support the offensive of the 5th Army towards the northeast and hold along the rest of the front, while waiting for the progress of the 5th Army on its left and that of the 4th on its right to permit it to pass to the offensive along its whole front.

The center was along the line of the Marshes of Saint-Gond, and the right corps, the 11th, was ordered to establish itself from Morains-le-Petit to Lenharrée, while on its right the 9th cavalry division was to move to Vatry, keeping the direction Châlons-Sommeseus, falling back on Sommeus in case of necessity. This division assured, besides, connection with the 4th Army.

6th September. The center corps tried to establish advance posts north of the marshes but had to withdraw them. It held the southern exits. The 9th cavalry division had an engagement in the vicinity of Coole with forces of cavalry—Saxon division probably—supported by infantry and artillery.

7th September. In the morning the 9th Army was violently attacked. Heavy batteries, established by the advance guard of the 12th corps near Clamanges, kept up a terrible fire until French cannon of large caliber engaged them. There was some very heavy fighting in the vicinity of Villeneuve-les-Charleville, Soisy and Mondement. The 9th corps maintained its position at the southern edge of the marshes, the 11th corps likewise resisted all day long; on its right the 9th cavalry division fulfilled perfectly its mission—it was joined to the left corps of the 4th Army near Mailly.

8th September. The German forces opposed to General Foch's 9th army, except the 10th

reserve corps, which the retreat of von Kluck's army on its right obliged to assume a defensive attitude, took the offensive along the whole front. The fighting was very heavy on the French left, where the 42d division, supported by the 10th corps of the 5th Army, succeeded in retaking Saint-Prix and throwing the enemy who had debouched to the south of the marshes back to the north of them. But, on the right, the 11th corps, was obliged to fall back to the front Corroy-Gourgançon-Semoine. Shortly after, however, a counter-attack executed on La Fère-Champenoise by the reserve division enabled the 11th corps to reoccupy the heights north of Euvy. On the right, the 9th cavalry division, near Mailly, remained in connection with the left corps of the 4th Army and had supported an attack launched by the latter in the course of the afternoon in the Sompuis region. There was, at this point of the battle, an impression of equilibrium between the forces. Captured orders show that the German general staff had not much confidence in the possibility of advancing: they prescribed that the wagon-tongues of the regimental trains should be pointed northward. On the French side, the 9th Army headquarters had been moved some 9 kilometers to the southeast.

On the 9th September, the battle continued along most of the front of the 9th Army with the utmost violence. A furious attack by the Guard before La Fère-Champenoise caused a part of the front to move back to Allemant and Connantre. On the right, a withdrawal was compelled from Gourgançon on to Salon.

General Foch's resolution was not shaken. The arrival of the 10th corps, borrowed from the 5th Army, allowed him to send the 42d division as a general reserve into the region from Linthes to Pleurs. At 4 o'clock this division counter-attacked on La Fère-Champenoise. This relieved the pressure on the 11th corps and really decided, for the 9th Army, the issue of the struggle.

By evening, the 10th corps on the left had reached Fromentières and Baye, and the action of the 4th Army on Sompuis was beginning to make itself felt.

(It should be remembered that this same night [9th September] the 18th corps of the 5th Army, in pursuit, took possession of Château-Thierry on the Marne. Two British corps had crossed the Marne. At 8 o'clock on the same night, von Kluck gave to his whole army the order to retreat.—En.)

On the 10th of September, orders were given for a general offensive along the whole front in the direction of Sommeus and Morains-le-Petit, with the 10th corps of the 5th Army attacking by the north of the marshes of Saint-Gond in the general direction of Bergères-les-Vertus. The Germans yielded at all points, greatly influenced, no doubt, by the information given to the 2d Army by the 1st that the latter was withdrawing in haste.

By 1 o'clock the 9th Army was along the front Sommeus-Morains-le Petit. It was ordered to gain before evening the front Villeneuve-Ren-

**MARNE, Battle of the—Continued**

neville-Germinon-Vatry. The 9th cavalry division was to push to Châlons in an attempt to cut off the retreat of the enemy, who, in the morning, was still occupying Sompuis.

**3d Army**

The 7th cavalry division, on the left of the 3d Army, was ordered to move to l'Isle-en-Barrois.

The enemy, in the course of the battle, showed so much activity in the Hauts de Meuse that, on the 8th September, the 7th cavalry division was sent in that direction, while the 2d cavalry division and the mixed brigade from Toul covered the region to the south of Saint-Mihiel. (This 2d cavalry division was probably taken from either the 1st or 2d army.—Ed.) Guns escorted by German cavalry were marching towards Saint-Mihiel to bombard it.

On the 11th, the 7th cavalry division was towards Saint-Mihiel, opposing one of the attacks made from the Hauts de Meuse. (This was the beginning of a determined attempt to pierce the French lines at this particular point. A salient still exists in the German lines about Saint-Mihiel.—Ed.)

G. M. R.

[The Marshes of Saint-Gond. By Charles Le Goffic. *Revue des Deux Mondes*, Sept., '16. 25,000 words.]

(A non-professional article based on published accounts, and verified by an examination of the battle-field itself. The author disposes of the legend that the German Imperial Guard sank in the quicksands of the marshes.)

[The Victory of the Marne. By Louis Madelin. *Revue des Deux Mondes*, Sept 15, '16. 23,000 words. One sketch-map.]

(Well-written, this non-technical article places the Battle of the Marne in the series of battles, such as Tolbiac, Poitiers, Orleans, Valmy, that have in the past saved France and possibly Christian civilization itself.)

[Apropos of the Battle of the Marne. By L. *Revue Mil. Suisse*, Aug, '16. 4500 words. 1 map.]

At first, the French, a little disappointed at the meagerness in tangible results of their victory, were content with very vague statements about the number of prisoners and trophies. Emboldened, perhaps, by this surprising modesty, the Germans then sought to make their own people and the neutrals believe that the battle of the Marne had been only a feint.

However, the authoritative German pamphlets no longer try to make the credulous believe that there was nothing on the Marne but advanced troops. There is no doubt that the I, II, III and IV German Armies and "some corps of the V, took part in the battle and then fell back behind the Aisne, where fresh troops re-established the balance."

According to a work on the battle, pub-

lished in Berlin, this was the German general staff's plan of campaign:

"The German high command decided at first to throw the mass of its forces to the west and to confide the defense of the eastern frontier to a small number of army corps. It was hoped that these troops, in concert with the Austro-Hungarian Army, could defy the assaults of the Muscovite colossus for a few weeks. Then, newly formed troops and the active and reserve corps made available by the settlement of the campaign in France, would have been in a position to take the offensive also on the Eastern frontier.

"The offensive was not to be delivered simultaneously on the whole western front. The general staff had decided to remain on the defensive from the Swiss frontier to the Donon and not to pass to the offensive between the Donon and Verdun except in certain circumstances, the principal task of these troops being to immobilize the enemy forces opposed to them. Between Thionville and Aix-la-Chapelle, however, the main body of the forces on the western front was to invade France by crossing Luxemburg and Belgium. While this was going on, they would seek to extend the right flank more and more towards the sea.

"By means of a wheel of the right wing via Brussels-Valenciennes-Compiègne-Meaux, Paris being left on the right, the French armies would be successively forced behind the Meuse, the Aisne, the Marne, perhaps the Seine even, so as to eventually envelop them south of Fontainebleau and take the whole French battle front in flank.

"During this time, other troops, principally reserve and landwehr corps, were to reach the coast between Dunkerque and Calais and prevent the landing of English reinforcements.

"Except for untoward circumstances, the execution of this plan could have been terminated by the end of Sept, 1914. At this moment, a great number of army corps would have become available for use against Russia."

Although this author does not state where he gets his information, it seems likely that it comes from good sources.

In France, it was believed, apparently, that the army of von Kluck, the German right wing, was marching on Paris and that it suddenly changed direction the 3d or 4th of September in order to cross the Marne to the east of Paris. It is possible that the German general staff considered a sudden attack on Paris, but that does not seem very probable. It would seem, rather, that von Kluck always had in view only the enveloping of the French Army and that he even neglected the fortress of Paris too much.

The main idea of the German plan can hardly be criticized. To beat the French first and then to turn against the Russians, nothing could be more logical. To turn the French by their left instead of butting against the Eastern barrier was likewise good strategy, if the French had let them do it. The facts have,

however, shown that this plan had a grave defect, that of not considering sufficiently the advantage which the French had with their excellent railroads.

The German plan would have been excellent in 1814 or even in 1870; it was no longer so in 1914. It was thwarted by the rapidity with which the French railroads, skilfully utilized, transported whole army corps from the right wing to the left wing. The Germans themselves have taken admirable advantage of their railroads to transport troops from one frontier to the other. It is curious that they did not realize that their adversaries would do the same thing.

Moreover, the best conceived plan is of value only if the execution is good. So it must be believed that there were mistakes in execution. The Germans account says not.

"What were the motives that decided (the evening of the 9th) von Moltke to move the German battle-line about a day's journey more to the north?"

"1°. The armies of the German right and center were *very much exhausted* by the forced marches and the continued fighting. They had lost a large proportion of their effective force of their fighting value.

"2°. Then, rapidity of progress, *the supply* (of rations and ammunition) *did not function* as well as could have been wished.

"3°. On the German side, they seemed to have expected a more rapid fall of the fortresses of *Liège, Namur and Maubenge*. The resistance of these forts gave the French generalissimo time to organize the defense on the Marne. Besides, some army corps, occupied with the siege of these places, were unable to arrive in time to take part with all their forces in the battle of the Marne.

"4°. *The energetic sortie of the Antwerp garrison*, coinciding with the French counter-offensive on the Marne, retained several army corps, especially the IX reserve and a part the III reserve corps. The presence of these corps on the Marne would have alone sufficed to cause to crumble the whole enemy line, already much shaken in the center.

"5° And this is the essential motive: *It is now established irrefutably that the Russian Government was already planning the war in the spring of 1914, for it began the mobilization then.* According to competent opinion, even Entente opinion, the Russians would not have been able, considering their system of mobilization and the immense distance to be covered, to take the offensive before mid-September. Now, the Russian offensive began in the second half of August, not only against Eastern Prussia, but also against Austro-Hungary. Besides, the Russians used more corps than had been supposed. It was thought that they would be obliged to have the Siberian corps to observe Japan, the 22d to observe Sweden, those of the Caucasus against Turkey and several others to repress interior disturbances.

"The Germans succeeded, it is true, in expelling the Russians from East Prussia at the end of August. However, the Austrians, as-

sailed by the main body of the Russian forces, could not, in spite of real successes at the beginning, resist this formidable push. That is why it was necessary, at the end of August, before the deployment of the German armies against France was finished, to transfer troops to the Eastern front.

"In spite of the high military attainments of General Joffre, who recognized the danger and took the proper measures to ward it off, the battle of the Marne would have been a decisive victory for the Germans, if it had not been for a series of accidents unfavorable to them, and, above all, *if the Russian Government had not already commenced in secret to mobilize the Russian Army in the spring of 1914.*

"Even according to the French sources most worthy of belief, the battle of the Marne cannot be viewed as a German defeat. It was rather a *battle broken off by the Germans for tactical reasons*, the result of circumstances that have nothing to do with the battle itself."

Evidently, the author meant "strategical reasons."

The German writer, Karl Bleibtreu, in a Swiss paper, gives as the reason for the German check "a serious tactical mistake by von Kluck," but the censorship apparently prevents him from saying in just what it consisted.

It is probable that all the motives mentioned in the German pamphlet played their part in the decisions of the German general staff. No protest lies against the enumeration of the motives, but against the importance ascribed to each of them.

If it can really be proven that Russia had been mobilizing since spring, will the German general staff admit that it was so badly informed as not to find it out before the battle of the Marne?

The Berlin pamphlet informs us that "the retreat of von Kluck and von Bülow involved the abandonment of the advantages acquired by von Hausen. This was the more regrettable because the French generals commanding in the center, in spite of the reinforcements which they had been receiving continually, would not have been able to hold a day longer. If the withdrawal of the German right wing had not been ordered, the left wing of von Bülow and the army of von Hausen would have pierced the French center on the 10th."

That is perhaps the only point about which the French and German versions are in flagrant contradiction. After having been obliged to yield ground on the morning of the 9th, the army of Foch had counter-attacked with success on the afternoon of the 9th. His army order for the 10th prescribed the offensive at 5 o'clock in the morning on the whole front. Nothing then authorizes the Germans to claim that they could have beaten that army on the 10th, if they had wanted to.

Moreover, they did well not to want to. It was too late, the battle was lost elsewhere.

"Towards the end of the morning of the 9th, General von der Marwitz (commanding the screen left by von Kluck south of the Marne) had to announce to his chief that he

**MARNE, Battle of the—Continued**

could no longer resist the English Army and the 18th French Corps.

"As the superiority of the enemy's left wing became more and more apparent, General von Kluck was obliged to resign himself, after consultation with the chief of the General Staff, to give the order to discontinue the combat.

"The withdrawal of the first army naturally brought a modification of the front of the neighboring armies, the II and III.

"In spite of the situation favorable to the German center, von Bülow saw himself obliged to give the order to retreat on the 10th, for he had received from von Kluck that morning advice to the effect that the latter could not defeat, in a decisive manner, the armies of Maunoury and French, whose strength was double his own."

That is what our Berlin author himself says of the armies of von Kluck and von Bülow on the evening of the 9th and the morning of the 10th. After that anyone may conclude which of the two adversaries would have had the greater chance of overwhelming the other on the 10th of September, if von Kluck had not broken off the combat beforehand.

It seems to be tolerably plain that, except for a miracle, the German Army could not have held a day longer. If its chiefs had not had the *sang-froid* necessary to discontinue the combat at the right moment, von Kluck would have been crushed the 10th or 11th between Maunoury and French, reinforced by the 18th French Corps. At the same time, von Bülow, attacked in front by Foch and on his right flank by Franchet d'Espérey, would have had great difficulty in extricating himself. For the Germans, it would have been a catastrophe comparable to Waterloo, Leipzig or Jéna.

After studying the maneuver of von Kluck from the 6th to 9th of September, it is impossible to agree with Bleibtreu that von Kluck committed a grave error. In all probability he did all that it was humanly possible to do. If he was beaten anyhow, it was because his chiefs had sent him into a hornet's nest, without taking any measures to extricate him.

The late General von Moltke did not have the reputation of having inherited a very great part of the talents of his illustrious uncle. It would not be astonishing if, once the enormous machine was put in motion, von Moltke did not have a firm enough hand or a clear enough head to direct it surely. He must have hesitated, reversed himself, yielded to imperial suggestions; in short, one does not see in his maneuver a dominant idea as in that of Joffre. All the armies are on a line, almost without any echeloning in depth and spread too evenly over the whole front. They said they wanted to maneuver by the right but they accumulated forces on the left. The army of von Kluck, on the extreme right, was much too small for what it had to do, and it is not clear why it was not followed by everything available elsewhere. With two

army corps more, von Kluck would very probably have won his battle.

Evidently, it is easy to criticize after the event, but the maneuver of Joffre was so simple and so natural that the German general staff should have foreseen it and taken measures in consequence. Even if the composition of Maunoury's army was not known, still it was known that Paris was a great fortress and railroad center which could not be left on the flank during the decisive maneuver without masking it by a strong detachment.

To sum up, German strategy failed in the conduct of the operations. In spite of a well-conceived initial plan and careful preparation, it had inferior means at the decisive point and moment. That is why it lost the battle.

The tactical excellence of the instrument, the troops, permitted the commanders to collect themselves and to avoid the catastrophe.

That does not alter the fact that the battle of the Marne, indecisive up to the last moment, put an end to the German offensive and caused the great plan to fail decisively.

From a tactical point of view, the battle of the Marne was a French victory, since the French were masters of the battlefield.

From a strategical point of view, it was the great victory which, henceforth, as far as can be humanly seen, makes the final triumph of the Central Powers impossible.

**MARTIAL LAW**

See also

PROPERTY RIGHTS (IN WAR)

**MAUSER RIFLE**

[The Mauser Rifle. By José Frohard, M. Major of Artillery. *Memo. Estado Mayor* (Colombia), June, '15. 2000 words.]

Gives the nomenclature and purpose of all the parts of the rifle.

The subject is treated under the following heads:—

1. The barrel with its sighting devices.
2. The breech and breech block.
3. The extractor and ejector.
4. Firing mechanism.
5. The magazine.
6. The stock.
7. The hand guard.
8. The ramrod.
9. The bayonet.
10. Attachments and accessories, sight guard, gun sling, cleaning rod, etc.

**MECHANICAL TRANSPORT**

See

MOTOR TRANSPORT

**MEDICAL CORPS**

See

SANITARY SERVICE

**MESSES**

See also

KITCHENS—MILITARY

**METALS**

—Use of in European War

[War Metals. By Charles Nordmann. *Revue des Deux Mondes*, Nov 1, '15. 5000-words.]

It is to-day abundantly plain that the valor of soldiers is a direct function of the enginery operated by them, and of the quantity of metals available for the manufacture of projectiles and weapons in general. Of these metals, iron is easily first in importance; its supply is adequate on both sides. But the output of the Central Powers is inferior in quality to that of the Allies. In 1913, the latest year of which complete statistics exist, Germany produced 19,000,000 tons of steel, of which only 4% was acid, as compared with a total of 7,600,000 tons for Great Britain, of which 74% was acid. Manganese is, as everyone knows, of the highest importance in the manufacture of shell and shrapnel. The principal producers of this metal are in order of rank Russia, India and the United States, who between them furnished in 1913, 93% of the total. The raw material is pyrolusite, of which in this same year, Germany imported 670,000 tons chiefly from Russia. These statements must not be interpreted to mean that Germany is embarrassed in respect of manganese steel, for she exported in 1913, 4,300,000 tons of steel, which she can now turn to account for herself and her allies. Chromium is needed in the production of special shells, suited for armor plates, etc. Chromium ores come chiefly from New Caledonia and South Africa; some are found in Russia, Asia Minor and Greece. Nickel is another important military metal, indispensable in gun steel, armor plates, and certain projectiles. It has no known substitute. The world output of the metal in 1912 was about 26,000 tons, of which about 85% came from Canada, the remainder from New Caledonia. The nickel ores of enemy territory are scarce and poor. The Scandinavian supply, 400 tons in 1912, is limited.

Copper is, next to iron, the most important war metal. [The original explains its employment in the fabrication of cartridge cases, rifling bands, etc., then gives some account of rifling itself.] In 1913, the world output was about 1,000,000 tons, of which 55% came from the United States. Japan comes next with 7.3%. Among the Allies, Italy furnishes only 0.16%, Great Britain 0.03% of the total. France has no copper mines. Germany produces 2.5% of the total. Hence none of the belligerents can begin to supply its demand for this metal. The Allied fleet compensates this deficiency on one side, and aggravates it on the other. Between January and March, 1914, Italy imported 5000 tons of American copper, and Scandinavia none; in 1915 (same months) the Italian importation rose to 14,000 tons, the Scandinavian to 6000. [The conquest of Serbia will do something to relieve the situation for the Central Powers.—Ed.] Lead calls for no particular comment, since it is abundant everywhere. But tin, comparatively important in war, comes mostly from Malaysia: Germany produces very little. Zinc has quintupled in price since the war; it is now more costly than copper, although copper too has gone up. It is abundant on both sides. Aluminum is of the greatest value in aeronautic construction. It

forms the ogival tip of the 77 mm. German field gun shell. It is also in a finely divided state a constituent of "ammonal," the high explosive of the Austrian howitzer shells. In 1913, half of the world supply of this metal came from the United States and Canada, the remainder being about equally divided between France, the British Isles and Switzerland. Some 800 tons came from Italy. Germany, to whom this metal is far more important than to any of her adversaries, is practically limited to such supply as she may obtain in Switzerland. [The original then scientifically including hydrogen among the metals, dwells upon the use of this gas in ballooning.] To sum up, of the ten principal and indispensable metals, our enemies, have without doubt a sufficient supply of five, to wit: iron, manganese, chromium, zinc and lead. Their native resources are inadequate to a proper supply of the remaining five.

In their scientific preparation for this war, the Germans must certainly have laid in a stock of the metals and of their ores, of which they ran a chance of going short. But on the other hand they unquestionably counted on a short and crushing war. What their state is in respect of metal supply can only be conjectured. It should be recollected however that the Germans are past masters in the science of applied chemistry, and that they must be bending all their energies to the discovery of successful substitutes.

#### MEXICAN EXPEDITION (U. S.), 1916

See also

MOTOR TRANSPORT—USE OF IN U. S.-MEXICAN EXPEDITION, 1916

SUPPLY AND TRANSPORT—USE OF IN U. S.-MEXICAN EXPEDITION, 1916

#### MEXICAN WAR (with U. S.)

[Sources for a History of the Mexican War, 1846-1848. By Justin H. Smith. *The Military Historian and Economist*, Jan, '16. 5000 words.]

The Mexican War can be likened to a New England thunderstorm, made up of local currents and a few black, tufted clouds, which overwhelms some valley with darkness, roar and flood, yet is plainly visible in its entirety from the neighboring mountains. No foreign nation was involved, and the sources of material for a correct and impartial history of the war are clear and easily traced.

The military features included all operations in a country widely different from our own. The geography and topography of Mexico require study; and the Mexican himself is not only foreign to us, but intrinsically peculiar—combining the Spaniard, the Moor and the Indian, and including here and there other strains. The evolution of the Mexican world of 1846 needs to be understood and its characteristics noted.

Whether or not the war was a result of differences of race, religion or slavery needs study, as well as the effect of the occupation by Americans of extensive Mexican districts and the constant intercourse between the two nationalities. And in this consideration it

**MEXICAN WAR (with U. S.)—Continued**

must not be forgotten that the American people were not at that date precisely what they are now.

Again, the financial side of the conflict needs consideration; and in this, as well as other prominent features of the war, the personal characteristics of the chief actors had, of course, vital bearing on the events.

(In the enumeration and discussion of sources, the author indicates in a measure the relative values of state and other diplomatic documents, military and political histories, and personal memoirs.—Ed.)

[The War with Mexico (1846-1848). *Professional Memoirs*, Mar-Apr, '14; Supplement No. 1. 125 pages.]

(A bibliography of several hundred annotated references "on the causes, conduct, and political aspect of the war, together with . . . the resources, economic conditions, politics and government of the Republic of Mexico and the characteristics of the Mexican people." Although this publication antedates the commencement of the *Digest*, it is included here on account of its current interest.—Ed.)

**MEXICO****—History**

See also

MEXICAN EXPEDITION (U. S.) 1916

MEXICAN WAR (WITH U. S.)

VERA CRUZ—U. S. OPERATIONS AT IN 1914

**—History—Revolutions of 1911-16**

See also

AGUA PRIETA, BATTLE OF

**—Military Conditions**

[Mexico: Its Political Situation, Its Resources, and Its Military Strength. *Scientific American*, Apr 29, '16. 5300 words. Map. Illustrations.]

(Editorial note: This article is written by one who served in the army in the Spanish-American War, and was for years connected with the Civil Government of the P. I. He has also lived among the Mexicans.)

The area of Mexico is equal to that of the United States east of the Mississippi less Florida. The climate is governed more by altitude than by latitude.

Of the approximately 15,000,000 inhabitants, about 20% are pure Caucasian, the remainder equally divided between Indians and mixed breeds. 50% of the people are illiterate.

There are few railroads, mostly government owned. Four lines leave the border and two run from Vera Cruz to Mexico City. There are no good wagon roads except in central Mexico. The old "camino real" from Vera Cruz to Mexico has been allowed to fall into disrepair.

The control of Mexico requires only the occupation of the railroad termini on the coasts and of the main routes of travel. Such an occupation need not be extended. But the present strife is hopeless. There is not enough cohesion to allow any one party to subdue all of its opponents.

The Mexican army under Diaz numbered about 50,000 men and was fairly efficient, being comparatively well equipped and thoroughly disciplined. The reorganization started by Madero and completed by Huerta was along modern lines. The strength never reached more than 60,000, and these were inferior to Diaz's troops. The Carranza-Villa forces which overthrew Huerta were mainly mounted infantry. There has been no effective use of artillery. Then came a rupture between these two leaders. The remnants of the old Diaz army and of Huerta's federales stood by Carranza, but the major portion remained loyal to Villa, who was the idol of the rough and ready adventurers. Villa, however, lacked genius for organization.

The only military genius developed by the four years of strife is General Obregon. He has succeeded in uniting the fragments of several different factions into what appears an effective whole. In two pitched battles he defeated Villa, and he now has an army of 40,000 men, all accustomed to campaign. Although the organization is poor and the arms and artillery a heterogeneous collection, General Obregon's army constitutes the military strength of Mexico to-day.

There are four munitions factories in the vicinity of Mexico City, two for small arms ammunition (for Mauser ammunition, and most of the Mauser rifles must be worn out), one for field artillery ammunition, and the fourth practically a repair shop. The country offers many advantages for defense, but due to internal conditions and lack of organization, no effective resistance could be made to an occupation of territory. Fifty thousand well trained and well equipped troops could occupy Mexico and destroy it as a political entity, and an equal number of troops could guard the lines of communication. Whether they could restore order and peace may well be doubted. An indemnity and cession of territory could be exacted, but the ceded territory would have to be conquered and the indemnity probably could not be collected.

Something more than violence is needed to restore peace to Mexico. Peace must result from a constructive policy such as has been carried out in the Philippine Islands. The many evidences of friendship on the part of the United States have not been able to overcome the old attitude of hostility to the "Gringo."

**—Motor Transport in**

See

MOTOR TRANSPORT—USE OF IN U. S. MEXICAN EXPEDITION (1916)

**—U. S. Operations in, 1916**

[The Texas Bandit Problem. By Major H. A. Smith, 28th Inf. *Infantry Jour.*, Mar, '16. 2800 words.]

Small bands of Mexican bandits have been crossing the Rio Grande into Cameron and Hidalgo Counties for a year past, stealing horses and cattle, intimidating people, and, on two occasions, have attacked United States troops at night.



Reliable reports now indicate a force of 200 bandits organized on the Mexican side under a former United States sheriff and politician, Luis de la Rosa. One battalion of the 28th is assigned to a front of over 20 miles with orders to protect the people in person and property, to co-operate with the civilian authorities in preventing smuggling, and to arrest and hold for investigation all armed Mexicans.

Between Los Ebanos and Granjeno, there are 20 fords in the Rio Grande. Smuggling is, therefore, closely allied to the bandit business. The bandits are generally in groups of 10 to 15, at times as great as 60.

In the days of Porfirio Diaz, there were few bandits, due to his iron rule. They flourish at present.

The problem is to prevent them from committing depredations on this side of the river. Numerous detachments of infantry are required with cavalry patrols. The time factor, when it is a matter of securing information, is important. Too many distinct allied forces make the task of collecting, sifting, weighing and transmitting evidence difficult. No other system, it must be added, could be enforced at this time.

The only practical solution of the problem is to patrol aggressively between stations, watch the crossings, become thoroughly acquainted with the roads and trails, study the character of the Mexicans and those of Mexican descent. To ensure absolute rest for each detachment, a field work is deemed advisable for each detachment along the river.

In case a band crosses into this country, a vigorous offensive is necessary. The trail must be kept warm, and long range fire is of little use. Information is hard to get from the Mexican inhabitants of Texas, but is possible if cautiously attempted. Encourage hunting and exploration of the country, and keep the command always a well instructed and disciplined organization.

[On Villa's Trail. *Independent*, Apr 17, '16. 700 words.]

The pursuit of Villa has gone on during the week, and he continues his flight toward Parral. American cavalry is hot on his trail south of Satero. The line into Mexico has been extended over 400 miles, and the transportation problem grows steadily more difficult. *De facto* President Carranza has refused the use of the railroads, and the expedient has been tried of shipping to private traders in Chihuahua, and other methods of supply are under consideration.

Rumors that the force will be withdrawn from Mexico are denied. The purpose is to capture Villa, and there is no reason to believe that this purpose will be abandoned.

## MILITARY EDUCATION

See

EDUCATION, MILITARY

## MILITARY HISTORY

[System of Work of the Historical Section of the General Staff. By Lieutenant Colonel F. J. Diaz, Chief of the Historical Section of

the General Staff. *Mem. del Ejército* (Chile), Aug, '16. 3300 words.]

The art of troop leading is founded on military history, the highest and the most important of all military sciences. All General Staffs and all Academies of War have given military history a very prominent place in all schedules of instruction.

Frederick II, Napoleon, Archduke Charles, Scharnhorst, Clausewitz and Moltke, have stated that historical studies are the only means to obtain a thorough understanding of war.

Military history may be classified under three headings: First, spontaneous or narrative history; second, reflexive history; and third, history with a scientific leaning.

In the first of the foregoing headings, an effort is made to give the facts, leaving to the reader the task of drawing his own conclusions. In other words, it is nothing but an application of the rules governing the criticism of historical truth. With the second class, based on the facts related, and independently of them, analytical estimates are made.

When we come to the third class, certain principles are established based on simultaneity of events.

The historical section has, at the present time, two very important functions to fulfill.

1. To write historical statements of all the campaigns.

2. To complete, or rather to prepare for, the work described in number one, by first compiling historical monographs.

In the preparation of historical statements or of monographs, the following plan should be adopted:

(a) General exposition of the political situation, internal and external, which brought about the war.

(b) Statement of the strength and composition of the forces of both belligerents, due regard being paid to race, character, instruction, organization, resources, etc.

(c) Description of the theater of war.

(d) Plan of operations.

(e) Statement of marches and of combats, with as much detail as is possible from the material collected.

For an exhaustive study, rich and well organized archives are needed. The following historical data should be part of the archives:

1. War diaries.

2. Reports of engagements.

3. Memoirs, autobiographies, diaries.

4. Other documents, such as letters, communications, press reports.

5. Traditions transmitted by word of mouth.

## MILITARY LAW

See

LAW, MILITARY

## MILITARY ROADS

See

ROADS, MILITARY

## MILITARY SCHOOLS

See

SCHOOLS, MILITARY

**MILITIA**

[Militia Systems. Editorial. *Infantry Journal*. Jan, '16. 1200 words.]

In drawing conclusions from the article on "A Test of the Swiss Military System," one must avoid extremes of opinion. The whole question of the value of militia is one of degree. Militia is simply a frame-work upon which organization can be built, and it must be considered as no more than this to establish it in correct proportion. A large measure of the discredit into which our militia has fallen is due to their being called upon for performances of which it was incapable, and to which it should never have been assigned. Fiascos like Niagara, Bladensburg, and Bull Run were the inevitable results. The distinction between first line and second line troops must be grasped. Time of training is the basis of distinction and nothing else. Even the Swiss system, probably the best, seems to show this distinction existing between troops. No efficient system can be built up so long as this primary distinction, so vital to efficiency, is ignored.

[The Militia Ballot. By Col. R. H. MacKenzie. *United Service Mag.*, Jan, '16. 2000 words.]

Explanatory of the principle, methods, and procedure of the ballot up to to-day, together with probable modifications.

**United States**

See also

NATIONAL GUARD (U. S.)

—Instruction and Training

See

FIELD ARTILLERY—INSTRUCTION AND TRAINING—MILITIA

**MINES**

[Examination of the Scandinavian Mine Commission's Theory of the Effects of Mines in Water. *Svensk Kustartilleritidskrift*, Vol. 2, Part 3, '16. By Lt. Waloddi Weibull, R.C.A. 2800 words. 5 figures and several formulas.]

See also

ASPHYXIATING GASES—FROM MINE EXPLOSIONS

—Automatic

[Automatic Submarine Mines. By Manuel Barbosa Casqueiro, 1st Lieutenant of Artillery. *Revista de Artilharia*. Oct, '15 4500 words. 20 illustrations.]

(A continued technical discussion of the various types of mines, for which reference must be made to the text.)

(Automatic Submarine Mines, continued. Translation by Manuel Barbosa Casqueiro, First Lieut. of Art. *Revista de Artilharia*, Nov, '15. 2500 words, 12 illustrations—to be continued.)

A technical discussion of the subject, translated from the *Journal of the U. S. Artillery*, August 1912.

—Laying—By Submarine

[Mining by Submarines. *Army & Navy Gazette*, July 29, '16. 400 words.]

The captured U. C.-5 is of simple, almost crude design. This construction indicates that perhaps large numbers of these submarine mine-layers have been built within the past six or eight months. The German press indicates as much.

Greater success is predicted for "diving cruisers" of 5000 tons, surface speed 26 knots, and submerged speed 16 knots. They are to carry 90 torpedoes and 125 to 150 mines. If and when such submarines are built, their visibility will be greater, and a way will be found to catch them.

—Mine-sweeping

[The Development of the Science of Mine-sweeping. *Journal of the Royal Service Institution*, Nov, '15. Translated from *Nauticus* of 1914. Diagrams. 6400 words.]

(This article, treating of the methods of protecting ships against mines, as well as of the discovery and rendering harmless of such mines, is in completion of two earlier articles on the under-water protection of warships and the development of mines.)

Naturally, the development of measures for the combating of mines followed immediately upon the development of the mine itself. The mine was used from the very first as a weapon of offense, and it became necessary to find some means of protection against it.

As early as 1777, moving machines were discharged in the Delaware against British ships lying off Philadelphia, by an ingenious American inventor named Bushnell. These machines gave the British a great deal of trouble, since a warning of a threatened attack would cause them to keep up a fire for many hours upon anything detected floating in the river.

This method for protection against the novel danger, later ridiculed in a ballad called "The Battle of the Kegs," was the best that presented itself at the time. Later, in the blockade of American harbors by the British in 1813, and in the Crimean War, nothing more useful seems to have been employed in the detection and destruction of mines than dragging for them with nets, etc.

During the American Civil War, however, mines began to be used on so large a scale and so effectively that it became necessary for the Northern States to adopt adequate measures for protection against them. The first idea was to creep for the cable connecting the torpedoes, in the hope that the creep would break the cable or explode the mines. Later, chains towed between two vessels were used in an attempt to seize the moorings of the mines, the latter being then raised and rendered harmless. These methods do not appear to have met with any great measure of success.

In 1863, Capt. Ericsson constructed his mine-destroyer, in those days called "Ericsson's torpedo." This consisted mainly of a strong float attached to the forward part of the ship and extending well to the front of the bow. At the extreme front end of the float and several meters under the surface of the water was fixed an explosive charge of 700 lbs. of powder. In front of the charge were rigged

two timbers which, upon engaging an obstacle, closed upon each other as do the parts of a parallel ruler, thereby igniting the charge. The important feature of the invention was the air chamber placed directly in front of the charge. This gave way at the push of the explosion and allowed the full force to be sent forward against the obstacle, thereby protecting the float itself from any damage.

A large number of these mine-catchers were produced at that time, but for some reason or other no further use was made of the invention.

Up to quite recent times nothing had been done toward the improvement of methods for the detection of mines. They had been used mostly as a weapon of defense for the protection of coastal localities and the blocking of channels, until the outbreak of the Russo-Japanese war. During this war, however, it became the custom to strew broadcast great numbers of unanchored mines, and it became necessary to find a means of searching out the location of these mines and destroying them.

Probably the oldest method of protecting warships against mines was in the use of less valuable ships as exploders. One or more of these would go ahead of the battleships, in the hope of striking and exploding enough mines to make a breach in the minefield. The exploder had to be of draught at least equal to that of the ship to be protected, and also had to be so constructed that after the explosion of the first mine the engines would still drive it ahead to the destruction of others. To meet the latter requirement, the ship had to have its engines located aft, as in the case in tank steamers. Of course, the exploder was inevitably sacrificed, so that the method was a very expensive one. Other objections were that even a number of these ships might go through a field and miss the mines that would sink the ships to be protected, and that success in the exploder's mission meant sure death to her crew.

Another contrivance for the discovery of and protection against mines is the mine-catcher. This is a very heavy and clumsy apparatus, consisting of steel frames or wooden balks fixed to the sides of the vessel, supported and stiffened below by wire hawsers. The mine-catcher is expected to break the moorings, causing the mine to rise to the surface, where it can be rendered harmless, or to overturn the mine, causing the explosive to be displaced. In any case, it is quite likely that the resulting explosion will damage the catcher, necessitating frequent repair. In order to be able to break a wire hawser, the mine-catcher has to be very strongly constructed. This results in a bulk and weight which greatly hinder the proper navigation of the ship and hold it down to a very slow pace.

Mention is here made of counter-mines, although they are in reality not used to seek out the location of mines, but rather to destroy a field which has already been located. The counter-mines are joined up in a series and towed along on a wide front. When it is found that the counter-mines have engaged

the enemy mines, the boats sheer off the necessary distance and the charges are exploded by electricity, the nearby enemy mines being thereby destroyed.

A many-fluked grapnel, called a creep, is often used to drag for the cables of such mines as are exploded from the shore. In some cases the fished-up cable fails to break, so that it is well to have an explosive charge in the creep, with an arrangement for detonating it from the vessel by which the creep is operated.

During the American Civil War, search was made for mines with chains and hawsers. This is the method which will usually be employed when no other means are at hand. It was the one used by the Russians when they first started searching for the mines which the Japanese placed in waters about the harbor-mouth at the siege of Port Arthur.

The Russians used two boats in dragging for mines, with a hawser stretched between them. It was soon found that little could be accomplished with this arrangement on account of the fact that the hawser in motion tended to rise toward the surface, and that it formed an acute angle in the middle, thus reducing greatly the area swept. The first of these difficulties was partially overcome by attaching weights to the cables where they were fastened to the sweeping-hawser. A further improvement, partially overcoming the second difficulty, was in placing floats at the ends of the cables, suspending weights from each float to the proper depth, and attaching the hawser to these weights. The floats were so constructed and attached as to cause them to sheer out, thus giving the sweep the necessary spread.

From this time dates the organization of the first mine-sweeping flotilla ever employed. It searched and cleared the channel on a regular plan, affording ships a safe ingress and egress. No Russian ships went out of the harbor until the mine-sweeping flotilla had first searched the channel.

The use of floats and weights necessitated a contrivance of great bulk, difficult to cast and haul in, and too heavy to permit of any but the slowest speed. To overcome these difficulties, use was made of the well-known theory that a pent-shaped log, towed behind a boat, can be kept at any given depth with any given speed by adjusting the tow-line to the proper length.

A Swedish inventor, named Sjöstrand, used this theory in producing his mine-sweeper, which consisted of a drag-hawser attached at the ends to logs or kites kept at the proper depth by regulating the length of cable and the speed of the vessel. The kites were constructed and attached in such manner as to cause them to sheer out and maintain a wide spread of sweep.

This Swedish device was in reality only a mine-searcher. An improvement converted it into a mine-remover as well. The hawser was so attached to the cable at one end that, upon encountering a mine-moorings, it would break from the cable. At the loose end was fixed a grappling-hook containing an explosive

**MINES—Continued**

charge. The mooring having been encountered and the hook end freed thereby, the hawser was dragged along the mine cable until the hook or catcher grappled and held it. The charge was then exploded from the ship and the mine destroyed or brought to the service.

The removal of mines brought to the surface is most easily accomplished by firing into them; for this work, small-caliber guns firing shell should be provided. Small-bore rifle bullets make holes so small that the water enters very slowly into the mines. Guns firing shell produce much larger holes, and there is always the possibility of exploding the mine with a fragment.

The great importance which the experience of war attaches to all means of combating mines has led to the production of a great many appliances, but none of them are practicable, so that the mine-sweeping appliance of Swedish origin remains the most advanced and the best.

Of course, this sweep is useful only against mines which are anchored, since it attacks the moorings. Against free mines, which are encountered in spite of the ruling against them in Art. 1 of the Second Hague Peace Conference (which several of the larger powers did not sign), there is no protection except a sharp lookout. The only real protection against drifting mines lies in the development of naval aircraft, from which the location of mines can be established, especially drift mines, which float on or near the surface.

**Organization in Different Navies**

The British organized a Mine Company, now the Mine Detachment, in 1905. Out-of-date torpedo-boats were made use of and performed good service. The Admiralty experimented with various methods of mine-sweeping, including the use of countermines. In 1910 a number of fishing boats were purchased for use as mine-sweepers, in conjunction with the torpedo-boats. The speedier destroyers were to accompany the fleet at sea, while the small fishing vessels were for protection in the home waters.

The French have no special organization for mine-sweeping, although it is known that they are giving their attention to the matter now.

The Russian navy has always been particularly skilled in mine work of all kinds. Their mine-sweeping divisions are composed of a number of steamers and torpedo-boats.

Very little is known of the organization of other naval powers.

It is certain that the science of mine-sweeping will not stand still, but will expand to meet the growing military requirements; and that navy will be wise which does not neglect it.

**—Submarine—Prediction Ruler**

[Mine Prediction Ruler. By 1st Lieut. Edward P. Noyes, C. A. C. *Jour. U. S. Artill.*, Jan-Feb, '16. 500 words. Illus.]

In the method of plotting now employed with mines, when a prediction is to be made

the plotter must measure the travel during the last fifteen seconds and remember it; measure the distance from the last plotted point to the group of mines and remember it also; pick up the slide rule, set it at the first distance and read the number of seconds to fire the mine opposite the second distance, both from memory; all this is in a limited time. Many inaccuracies are introduced and predictions must be made much sooner than they should be for most accurate work.

This prediction ruler determines directly the number of seconds to fire without the need of making all the measurements or using the slide rule.

For full description and method of using, see complete article.

**—Use of in Civil War (U. S.)**

[Submarine Mines During the Civil War (in the U. S.). By Sub-Lieut. W. England, Royal Coast Artil. *Svensk Kustartilleritidskrift*, Vol. 2, Part 1, '16. 6300 words. 3 diagrams and 1 table.]

(Historical article.)

**—Use of in European War**

[Fewer Drifting Mines. *Holland Gazette*, Nov 6, '15. Quoted.]

"In the course of October 7 mines were washed ashore on our coast, 3 British and 4 German. Since the beginning of the war 680 mines have been washed ashore here, including 353 of British, 57 of French, 97 of German and 173 of unknown origin."

[Floating Mines and Their Use in General; also the Employment of Mines During the Present War. By Lt. W. England, Royal Coast Artil. *Svensk Kustartilleritidskrift*, Vol. 2, Part 2, '16. 5600 words. 5 figures and 4 tables.]

(A short description of the different kinds of mines—the way they are anchored, how armed and disarmed—and some of the rules about the employment of mines adopted by the Hague conference. Mine-laying ships of the different nations, the areas that have been mined, etc., are described, and a list of vessels injured or sunk by mines is given.)

**MOBILIZATION**

[A Commendable Mobilization Plan. Editorial. *Army & Navy Jour.*, Aug 5, '16. 800 words.]

Those Pennsylvania troops ordered for Federal service were mobilized at Mt. Gretna. They arrived June 24 and 25 and the physical examination started on the 26th. There were 60 doctors available and they were sworn in on the 25th. The medical forces worked in three shifts of eight hours each for the first two days. The physical examination was thorough and complete. 1100 to 1200 men could be examined per day. The physical examination governed in speed, as it was much slower than the property work; 14,000 troops were examined.

In the examination of property, two officers represented the Federal Government and one represented the governor of Pennsylvania. (Details of methods of property transfer are given.)

From the experience gained, the ideal force of Federal officers for mustering in a division would be: one executive officer, one adjutant, two officers for inspection of property, one officer in charge of muster rolls, and one surgeon. Troops should be mobilized at a central point.

See also

#### PREPAREDNESS FOR WAR

##### —Industrial

See

#### PREPAREDNESS FOR WAR—MOBILIZATION OF NATIONAL RESOURCES

##### —Preparation for

###### Italy

[General Principles of the Italian Mobilization. By Lt.-Col. Manzanos y Chacón, Military Attaché in Italy. *La Guerra y su Preparación*, Aug. '16. 7500 words.]

#### MOBILIZATION DOCUMENTS

The three kinds of operations which we shall consider cannot be improvised. They must have been prepared during peace, and each be documented with orders and special instructions, having each a special number and contents depending upon the nature of the operation. These documents are regarded as absolutely confidential.

1°. In order to pass from a peace- to a war-footing, the following documents are employed:

(a) *Mobilization order*. This is communicated by the Minister of War at one and the same time to all the authorities depending upon him and to all the civil authorities concerned. This order provides for the execution of the operations and indicates the date on which the mobilization should begin; orders of requisition for cattle and vehicles are also included.

(b) *Instructions for the mobilization of the army*. In Italy, these are contained in three volumes. The first sets out, in detail, the organic forces at war strength of different units. The second points out the allowance of material which each one must take into the field. The third details the operations to be carried out in order to pass from peace- to war-footing, whether in time of peace or during real mobilization.

(c) *Confidential instructions for mobilization*. These constitute a complement to the instructions contained in the three preceding volumes.

(d) *Mobilization Indexes*. These are composed of the index properly so-called, and of various tables setting forth the allowances of armament, clothing, rations and so on. In each index are indicated for each arm, special service or corps, the units destined to act as centers of mobilization.

(e) *Mobilization Bulletin (first and second part)*.

This fixes the war designation of certain classes of officers.

2°. *War formation and concentration*. These are set out in a pamphlet indicating the manner in which the troops of the great war units will be constituted.

3°. The *place of concentration* is fixed in the pamphlet just mentioned. The concentration is carried out according to the following documents:

(a) *Project*. Indicates the great units to be formed of the units mentioned in the mobilization index; the place where these are organized and that of concentration, and whether the routing must be carried out by railroad or ordinary road.

(b) *Movement Orders*. Indicates the itinerary to be followed by troops to arrive at the point of concentration.

(c) *March Documents*. These indicate the marches to be made by the troops who travel by country road.

(d) *Military Railroad Time Table*. A time table for military trains from the third day of mobilization. There are other documents as well, but as they are confidential, they are never mentioned.

4°. *Passage from peace-footing to war-footing*. The operation of mobilization comprises essentially:

(a) The formation of the headquarters of the great war units, arms, army corps and divisions.

(b) The completion of the units of the permanent army in men, stock and material.

(c) The constitution of the militia.

(d) The constitution of the Supply Corps.

Mobilization operations are carried out by troop-units and by centers of mobilization, and are distinguished as preparatory (peace), and active or executory (during the mobilization itself).

#### I. Preparatory operations:

(a) Keeping up to date the returns of the different units and the *cadres* of officers.

(b) Dispositions for calling officers into he service.

(c) Dispositions for receiving, lodging, clothing, arming and equipping the reservists called to the colors by proclamation.

(d) Individual notification.

(e) Steps to be taken with respect to stock and vehicles.

#### II. Operations during mobilization:

(a) Order of mobilization and order for the presentation of the stock and vehicles requisitioned. These orders are telegraphed by the War Department to the authorities concerned.

(b) Order for the call of reservists previously notified. This also comes from the War Department.

(c) Distribution to public of proclamations calling to the colors men on unlimited leave and for requisitions for stock.

(d) Despatch, either direct or registered, of the summons to the colors as reservists previously notified, or of notification by post card, if this system is employed. Here also are included directions to appear to the owners of the stock previously requisitioned.

(c) and (d) are carried out by the centers of mobilization as soon as the order of mobilization is received. The proclamations must be printed and distributed in time of peace to recruiting zones, regiments, depots and to the Alpine regiments.

**MOBILIZATION—Continued**

(e) Co-operation of mayors. Mayors are charged with the duty of sending reservists to the headquarters of the respective centers of concentration.

(f) Carrying into effect the requisitions for cattle and vehicles.

(g) Inspection of personnel, equipment, etc., of the troops, transport of materials, and so on.

(h) Receipt and distribution of cattle and vehicles obtained by requisition.

(i) Incorporation of the officers and reservists of the permanent army, of the mobile militia, and of the territorial militia. Distribution of clothing, arms and equipment to companies, squadrons, etc., and formation of the units of the mobile and territorial troops.

(l) Departure of troop units and of the supply departments for the zone of concentration.

(m) Constitution of supplementary and reserve troops in regimental depôts.

(n) Constitution of the auxiliary military train.

**CENTERS OF MOBILIZATION**

These are the organisms charged to receive the reservists and to use them in filling the regiments to full strength and in the formation of the militia. They further receive cattle and materials requisitioned. Consequently, the following are constituted centers of mobilization: regimental depôts, store-houses of the Alpine battalions, sanitary and subsistence companies; and, in the case of the territorial militia, recruiting districts. Should the necessity arise, other units may be designated by the Minister of War. Centers of mobilization are either principal or secondary. The principal have charge of all the reservists on unlimited leave. As a matter of fact, they report in vast numbers. Territorial or mobilization exigencies, however, may cause a reservist to report at the special center called the secondary. Such, for example, would be formed by a regiment stationed in a recruiting zone itself.

It would be manifestly useless to send the recruits to the principal center and return them to the point from which they had started.

**Duties of the Mobilization Centers:**

1. *Regiments.* These act as centers of mobilization for the troops of the permanent army and have complete charge of receiving, clothing, arming and equipping the reservists. These reservists present themselves at the regimental depôts, which in turn pass them on to the regiments for distribution to the companies. Similar measures are taken in respect of cattle, wagons and materials.

2. *Depôts.* These are centers of mobilization for the mobile and territorial militia, with certain exceptions in the latter case, for example, arms and corps which have no territorial militia (cavalry and artillery). These depôts also look after the instruction and organization of reserve troops. Units of the mobile militia, recently created, receive their officers from the permanent army and from the complementary and auxiliary classes. The same procedure is followed in the formation of territorial units.

3. *Recruit Districts.* These are centers of mobilization for the infantry, territorial militia, for sections of the military train and for other special services. In these districts must present themselves: (a) Members of the infantry territorial militia forming the units of the said arm. (b) Members of the territorial militia, of the artillery and engineer trains, to form the squadrons of the auxiliary military train, etc. (c) Individuals of other classes who have received no military instruction and have not been, as yet, assigned to an arm or regiment. (d) Members of other regiments in respect of whom the district acts as a complementary district.

**MOBILIZATION PROJECT**

Every military authority charged with the execution of any mobilization operation, must prepare, in time of peace, his project of mobilization.

The project of mobilization is a document in which are enumerated in detail all the necessary operations, specifying the way in which they must be carried out. The said project, without omitting any detail, must be drawn up very simply and briefly, and be kept constantly up to date in order that all of its provisions may be carried out systematically and in a fixed time, and in order that, should there be a change of commanding officers, the new one may promptly acquaint himself with so important a business.

The project must consist of two parts: (a) preparatory operations belonging to time of peace, and (b) executive operations during mobilization. In each of these said parts must be set down the date and order in which the operations must be finished and detailed descriptions of the operations, the name or office of the person who must carry it out, and the form in which it must be completed. If the said operations are the object of special orders or documents, these must be prepared and carried as far as possible, leaving blank the parts to be filled at the moment of execution, and they must be appended to the project. Given the importance of this work, troops should be annually mobilized, not only to exercise the personnel, but to correct in the project defects brought out by practice.

**Infantry**

From such data as have been available and that may be regarded as trustworthy, the Italian army has been organized for the present war in accordance with the foregoing plans of mobilization as follows: Each regiment of infantry, of which there are 94, has raised its effectives to a war footing with reservists of the permanent army, leaving the surplus in the respective depôts and as a reserve to make good all losses occurring in the first line and to form new units in case of necessity. Regimental depôts, with the reservists of the mobile militia, have formed, some six, and others eight, companies of the said militia; all told 51 or 54 regiments. In other words, each brigade of the 48 constituting the 12 army corps has formed a regiment, out of which regiments have been organized 12 divisions

of the mobile militia as troops of the second line. These form the third divisions of each army corps.

#### Cavalry

The cavalry was mobilized in the same way with the elements of the permanent army. Of the 30 regiments of cavalry, of five troops of 136 men each, 12 form part of the corps and the remainder constitute the three permanent divisions. There is a fourth, which was formed on mobilization.

#### Artillery

The field artillery consists of 36 permanent regiments, 24 divisional and 12 corps. These regiments complete their effectives in men, cattle and material in the same way as the infantry. Each regiment has its depôt and a train company.

#### Engineers

The engineers are made up of the following troops: two regiments of sappers, one of miners and one of pontoniers, of four battalions each; one regiment of telegraph troops of five companies, and one of railroad troops of three companies. To these must be added aviators and balloonists.

#### Sanitary and Subsistence Troops

Each army corps has one sanitary and one subsistence company.

#### MONITORS

[Monitors. *The Army and Navy Gazette*, Oct 23, '15. 325 words.]

Ashmead Bartlett says the composition of the fleet off Gallipoli has undergone an entire change. After the advent of the enemy's submarines, we could not afford to risk our battleships. Naval support for the troops on shore was indispensable. The difficulty was overcome by utilizing the new fleet of monitors which the Admiralty had ordered when their value was shown by the flotilla off the Belgian coast.

Only a nation with absolute command of the sea, and with unlimited shipbuilding resources could have set to work to replace one fleet with another, of an entirely different type, at a few hours' notice, in the middle of a great war, while at the same time blockading the German fleet and holding all the world's trade routes.

The monitors off the peninsula are of three types. There is the "baby," too small for a name, with two 6-in. guns of the type in the *Queen Elisabeth*. There is the larger class, more like a Chinese pagoda than a ship, with a 9.2-in. gun in the bow and a 6-in. in the stern. A third and even more remarkable type is that carrying two 14-in. guns, mounted on a structure which below the surface of the water bulges out some 10 ft. and then curves under, forming a platform just washed by the waves.

The submarine-proof warships which have done such excellent work in bombarding the Turks are not all newly built, however. Some of the 25-year-old cruisers of the *Edgar* class are there, each "protected by a formidable waistbelt similar to that worn by the moni-

tors." The protection is hung from their sides by steel stanchions, as if most of their fittings had been washed away. The first four months of the war these cruisers were on patrol duty in northern waters. The sailors refer to these remodeled cruisers as "comics."

#### MONROE DOCTRINE

[The Monroe Doctrine and the Great War. By Moreton Frewen. *The Nineteenth Century and After*. Feb, '16. 6000 words.]

Two papers of painful interest to American readers recently appeared in the *Nineteenth Century and After*. They are "The Rôle of the Squaw" and "The Spiritual Crisis in America"; and in both the American administration is severely criticised. Issue is joined here with these and other critics of the President and his Cabinet, and in this connection attention may be drawn to the Monroe Doctrine and its relation to world diplomacy.

It would not be surprising if, after this present war, Germany being terribly impoverished, she would pick a quarrel with the United States, against whom she can successfully use her navy, which in all probability will emerge from the war untouched. The United States is the wealthiest country in the world, and the least prepared to resist. It will take years of earnest work to enable her to fight Germany successfully.

An investigation of the last hundred years' diplomacy will disclose that this colossal war is really America's own war; and that, in enunciating his "Doctrine" President Monroe was in reality tutored by George Canning, the most brilliant and the least trusted of England's Prime Ministers. From the very first, the maintenance of the Monroe Doctrine depended upon England's navy, and this is true to-day more than ever before. And the principle will either have to be abandoned by the United States or that nation will have to travel the whole road to an alliance with Britain. Had such an alliance existed in 1914 there would have been no war. Let us see how the doctrine has imposed a veritable strait-jacket on Germany, and how Central Europe, conscious of disease but unconscious of the remedy, has been filled with homicidal mania.

Somewhat more than a hundred years ago there was an outburst of the New Liberalism in France—the determination to individual freedom. Waterloo followed with its great mental and moral set-back. In the second decade of the nineteenth century it seemed both to despotic monarchs and to the man in the street that "the way of thinking" France had inaugurated was too explosive, and that the sun had set on modern Liberalism. No doubt some similar reaction awaits us in the days at hand. Europe, less than a hundred years ago, swung back to autocracy and the "Divine Right of Kings." Canning said of the terrible emergency which England alone was hardly powerful enough to face, that "I resolved that if France had Spain it should not be Spain with the Indies. I called the New World . . . to redress the balance of the Old." America was England's natural ally;

**MONROE DOCTRINE—Continued**

it is little wonder that Canning looked to the westward. He asked the American Minister to the Court of St. James, Mr. Rush, what he thought the American government would say to going hand in hand with England to notify the despots of the Holy Alliance that they must keep their hands off in South America. Here we have it in a nut-shell. Canning's "balance" was contingent on Great Britain plus America jointly guaranteeing control of the seas. Though the American government did not agree to an alliance, there is no doubt that this initiative had a great share in producing the explicit statement from Monroe.

The outcome, then, of the cross-currents of European diplomacy was the Monroe Doctrine. And if at any time England decides that the maintenance of the doctrine is no concern of hers, it will be immediately evident that this contention of the United States, far from keeping her out of the cockpit of Europe, is a sword of Damocles which threatens the world. America, unsupported by British sea power, cannot support her challenge.

One vast continent, from Patagonia to Panama, loomed up for German expansion at a time when the craving for such expansion was great. South of Panama, if anywhere, German ambitions could have found pacific settlement. But in this eminent domain she found the United States "claiming all outdoors": waving the white ensign of a British admiral. Though the United States has been unable to protect her own citizens and property in territory so close to her borders as Mexico, our "Uncle" has proved an excellent scarecrow in Brazil, where all the important conduits of finance are in German hands. At any time within the last ten years Germany could have picked a quarrel with the United States; Cuba could have been occupied, and from that base all the coast cities from Galveston to Portland could have been looted and held to ransom. At the end of the present war, if her fleet is left intact, she can be in New York harbor in a fortnight with a dominant fleet and a quarter of a million veteran troops. Relatively to the attacking fleet, the defenders would be as helpless as was Von Spee off the Falklands. There is no limit to the indemnity which might be exacted. It is true that, out of the splendid material which exists in America, an army might be created in three years, but it will take America twenty years to prepare sufficient expert personnel for a modern navy. Must we take comfort from the picturesque proverb of American philosophy which says that "there is a Providence which looks after children, drunken men, and the United States of America"?

It was with the greatest reluctance that the United States accepted the Hawaiian Islands, commanding the Pacific. And while Cuba remains exposed, can the coast cities of the Great Republic ever be secure?

The international situation that will confront the United States as soon as the present

war is over will be appalling. Gorged to satiety with mere wealth, she is in the midst of a world of nations armed to the teeth, and all seeking means to replenish their bankrupt treasuries.

One thing is certain: England must decide immediately after the war whether she will continue to buttress the Monroe Doctrine, or whether in case of its infraction by Germany, her attitude will be neutral. In this connection it is proper to point out that although England has nothing to gain by the Monroe Doctrine, the "loan" of her fleet is of transcendental importance to America.

What is the fleet worth to her? List, one of the greatest economists of the last century said: "The sea is the high street of the earth . . . the arena for the display of strength and enterprise of all the nations . . . the cradle of their freedom . . . the rich village common to all the economic peoples. . . . The man who has no share in the sea is thereby excluded from a share in the good things and honors of the world." An alliance between England and America would mean that the people of New York may sleep in peace; that the Monroe Doctrine endures at no cost to America.

After the war there should be a State trial, of importance without parallel in history. It should be in Washington. The world would doubtless leave to the Supreme Court of the United States to decide the question of Louvain, of the *Lusitania*, of Edith Cavell. The award of such a court might well for the future "make wars to cease unto the ends of the earth." If such a court acquitted Germany, the verdict would be accepted, for the standing of this tribunal is pre-eminent among the judicial courts of the world.

But, in the days at hand, it will be found that Monroeism is not compatible with a United Germany and there will be a recurrence of historic disaster unless the Monroe Doctrine can secure at last some rational interpretation.

[Modernizing the Monroe Doctrine. By Charles H. Sherrill. Boston: Houghton Mifflin Co., 1916. 8vo, pp. xiii+203. \$1.25.]

In this book the author attempts a definition of the Monroe Doctrine as it applies to the Western and Eastern hemispheres.

The problem of the Monroe Doctrine, as the writer sees it, is three sided, a "pan-American triangle for peace." The base of the triangle, and first in order of importance, is American solidarity, which involves three considerations: first, a better understanding of the meaning of the Doctrine on both continents; secondly, a sharing of the responsibility by the Latin republics; thirdly, the establishment of a conciliation board, patterned after the recent A. B. C. joint mediation plan, for the prevention of wars in the Western hemisphere.

For the second side of the triangle, the writer is concerned with eliminating all cause for friction with Europe. The program is the most sweeping proposed by the writer. Briefly, he would have all European nations



abandon unconditionally their ownership of all American colonies. The desideratum is the prevention of any possible extension of a European war to the Western Hemisphere in the form of colonial seizures, a condition not countenanced by the Monroe Doctrine. He proposes that the United States, aided by South American republics, purchase the colonies now held by England, France, and Holland, excepting Canada, which would be left to follow its own course. Many of the colonies are sources of expense to their owners and the price paid would be well received in writing off war debts. He startles the readers at this point by suggesting that, in the colonial barter, we trade the Philippines to Europe as part payment. It would do away with a source of danger to us in time of war and aid in solving the Far East problem. A corollary of this policy involves a modification or an annulment of the treaties hampering the United States in the Canal Zone.

The third side of the triangle concerns the Far East. In this zone, argues the writer, we should apply the same doctrine which we preach in the South, namely, absolute non-intervention, and asking of no favor not granted other nations. We should not construe the "open-door" policy in terms of special privilege for the United States; nor should we consider ourselves the natural protector of China. "Such is dangerous nonsense."

To criticize Mr. Sherrill's proposals would involve a discussion of the present situation in its entirety. To many, they represent the *summum bonum* in foreign relations. With the Americas free from European dominance and the Philippine bogey gone, little is left to be desired. One question immediately presents itself, namely, the willingness of European countries to withdraw from America, especially the willingness of England. Another is whether the Philippines would be acceptable as part payment, at the value set by the writer. These questions can be settled only through the channels of diplomacy.

A timely and interesting Preface to the book is written by Nicholas Murray Butler.

[From *The Journal of Political Economy*, Oct, '16.]

See also

PREPAREDNESS FOR WAR

## MORALE

See also

DISCIPLINE

EUROPEAN WAR—MORALE

WAR—MORAL FORCES IN

## MOROCCO

### —The Moroccan Question

[Morocco has Entered the War. By C. W. Furlong, F.R.G.S. *The World's Work*, Jan, '16. 2000 words. Map and illustrations.]

(A popular article, in light vein, on the Moroccan question, i.e., the rivalries of France, Great Britain, and Germany to secure control of the country.)

## MORTARS

See

ARTILLERY—FIRE—HIGH ANGLE

FIELD ARTILLERY

### —Range Finding—Effect of Wind

[Effect of Upper Air Currents upon the Accuracy of Mortar Fire. By 1st Lieut. Robert N. Campbell, Coast Artillery Corps. *Jour. U. S. Artill.*, Nov-Dec, '15. 2500 words.]

The experience of the writer in numerous balloon voyages leads him to believe that the assumptions upon which Lieut. Col. W. E. Ellis based his work on mortar fire (See *Jour. U. S. Artill.*, Sept-Oct, '15) are not fully warranted.

The best information upon air currents seems to establish:

1. That the upper air currents at any particular time do not behave the same in any two localities.

2. That the upper air currents in any particular locality do not behave the same at different times.

The effect of these atmospheric conditions is recognized by artillerists to some extent, as the Regulations for the Instruction and Target Practice of Coast Artillery Troops provide that record shots for mortar batteries shall follow the trial shots with the least practicable delay.

Undeterminable errors in mortar fire are too frequently attributed to the gun and ammunition when the real cause may be atmospheric disturbances. This is shown by the fact that all the shots of a salvo usually strike close together.

The following system of mortar target practice is suggested in lieu of the system at present followed.

An indefinite number of trial shots fired at the towed target until, as a result of observation of fire from a captive balloon or aeroplane, the battery commander, correcting after each trial shot from the data furnished by such observer, feels assured he is on the target. Then without loss of time the battery will open with salvos of four shots each and for record practice, fire two such salvos before any change can occur in the atmospheric conditions. The total number of trial shots to be allowed will be fixed by the appropriations. Four practices a year might possibly be held under this system without exceeding the ammunition allowance of the existing system.

## MOSS

### —Use of in Surgical Dressings

[Note. *Army & Navy Jour.*, Sept 23, '16. 250 words.]

Sphagnum moss, which grows abundantly upon moorlands wherever peat and heather are found, is beginning to be used extensively as a dressing for wounds. It is light and will absorb ten times its own weight in water. It is gathered in the British Islands by voluntary workers. It is picked, cleaned, and antiseptically treated, and put under a hydraulic press. The moss makes an especially good field dressing, being light and of small volume.

## MOTOR BOATS

See

SUBMARINES—DEFENSE AGAINST—MOTOR  
BOAT SUBMARINE DESTROYERS

SUBMARINES—MOTORBOAT SUBMARINE DE-  
STROYERS

### United States

[The Patrol Squadron. Privately Owned Motor Boats Pledged to National Defense. *Scientific American*, May 13, '16. 900 words. Illus.]

In response to a request by the Secretary of the Navy looking toward a mobilization of privately owned yachts and motor boats for patrol service, an organization known as the Patrol Squadron was formed, and five boats have been built as a nucleus. These boats were inspected in Boston harbor, Apr 28, by the Asst. Secretary of the Navy.

The boats are primarily adapted for use against submarines and for dispatch and patrol service.

Each boat is approximately 40 feet over all by 8 ft. 9 in. beam, and 30 in. draft. 135 h.p. engines give a speed of 27 miles per hour, but a larger engine giving 30 miles can be installed. The crew is four men in time of peace and six in time of war. Wireless of 100-mile radius is carried, and each boat will mount a 1-pdr. R.F. gun. There will be a practice cruise in June, and in September the squadron will join in maneuvers under war conditions. The boats have a cruising radius of several hundred miles without refilling fuel tanks.

## MOTOR-CYCLES

See also

MACHINE-GUNS—MOTORCYCLE TRANSPORT OF

## MOTORS

See also

AERONAUTICS—MOTORS

## MOTOR TRANSPORT

[Mechanical Transport for Military Purposes. By Lieut. L. J. Martin, B. B. and C. I. Ry. *Journal of the United Service Institution of India*. Jan, '16. 5000 words.]

We have only recently learned the value of motor transport, and in the future that subject must be given the closest attention. The following types of vehicles are necessary:

Motor cycle.

The light car.

The powerful touring car.

The lorry.

The *motor cycle* should be of standard design and permit side car attachment. It should have interchangeable wheels and single cylinder, air-cooled, detachable engine. Belt drive is preferred. The side car frame should be standardized to permit machine gun stretcher, passenger seat box, or other fixture to be attached.

The *light car* should be standardized, have an engine of about 15 B. H. P. at 1000 revolutions per minute and a road speed of 20 miles per hour. Provided its weight does not exceed 1000 pounds, this car should be able to

carry two men and 500 pounds freight over the most difficult roads. It should have a track of 4 ft. 8 in., short wheelbase (say 96 in.), and a clearance of 10 in. Under the assumed wheelbase, the driver's seat should not be more than 4 ft. from front axle, thus providing a cargo space of nearly 6 ft. x 4 ft. Equal sized interchangeable disc wheels, solid rear axle, two-wheeled trailers and abolition of the differential are recommended. Wheels of trailer and car should be interchangeable. The greatest advantage of this type of car is that its failure to reach its destination entails a loss of only 500 pounds cargo, whereas the failure of a lorry of 3 tons' capacity to reach its destination entails a correspondingly greater loss. The same shell hitting a 3-ton lorry means 3 tons' loss, and the liability to be hit increases as the square of the size of the unit, or roughly as the carrying capacity.

The *powerful touring car* should be standardized, but almost any standard car on the market will answer military requirements. Its body should be detachable and it should have disc wheels with detachable, divisible rims. Cars of this type should be reserved for high speed work from base to base or depôt to depôt, and for the conveyance of persons or small parties whose duties are administrative and the rapidity of whose movements is important.

*Motor lorries.* Their utility appears to be greatly overestimated and their use should be curtailed to the transport of articles whose bulk and weight prohibit the use of smaller cars. Mechanical transport is essentially intended to travel on roads. Travel across country might at times be advantageous, but is very exceptional. The United States Army thinks otherwise, and its specifications require that a lorry be capable of carrying a two-ton load anywhere where it could be taken by a team of mules. The "Jeffery Quad" was the result. This steers and drives with all four wheels and while it negotiates remarkable obstacles, it has its limitations. It would be preferable to remove or reduce obstacles so that a more normal type of vehicle could be used.

It may be assumed that even in the United States 99.9 per cent. of the transport will be confined to roads. Road maintenance therefore presents a serious question. Owing to its heavy axle load, the lorry is one of the most destructive agents. In war, traffic will be confined for prolonged periods to particular roads, and it is highly probable that these roads will not stand road traffic much greater than that for which they were designed. One of the gravest defects of the present lorry is the excessive dead weight compared to the carrying capacity. Moreover, the height of the platform from the ground does not facilitate rapid loading and unloading. Speed should be limited to 15 miles per hour.

Every lorry should be provided with a winding gear that will enable it to extract itself when mired. Its power should also be available for driving other stationary machinery, such as pumps, dynamos, etc.

Nuts, bolts, etc., and all boxes and crates intended for motor transport should be standardized.

Periodical inspection of all motor equipment should be provided and records of mileage and loads, fuel and lubricating oil consumption, tire replacement, maintenance, etc., should be kept. In addition, men of all branches should be given an opportunity to become familiar with driving.

[A Record Motor Truck Supply. *Army & Navy Jour.*, June 10, '16. 500 words.]

For the expedition into Mexico, motor transport was essential. On one day's notice, 112 trucks were purchased from the White and Jeffery companies. These trucks were loaded for shipment in less than 48 hours and delivered to the border in 96 hours. Since the Columbus raid, 324 motor trucks, from  $\frac{3}{4}$  to  $3\frac{1}{2}$  tons capacity, and of eleven different makes, have been purchased.

[The Automobile in War. By Paul Ferrao, Lieut. of Artillery. *Revista de Artilharia*, Mar., '16. 3000 words.]

(The author mentions the importance and the various uses of automobiles in war; describes briefly the organization in some foreign armies, notably the Belgian, French, and German, in general terms; expresses his opinions on some points of organization and handling, and refers briefly to the recruitment of chauffeurs and to the use of motor cycles.)

[Power Traction in War. By the Right Hon. Sir John Macdonald, K.C.B. Reprinted from *Journal of the Royal United Service Institution*, Aug., '15, in *Infantry Journal*, May, '16. 4400 words.]

Eight years ago I was allowed to read a paper in the theater of the Royal United Service Institution on "The Organization of Power Traction on Roads for National Defense." The military authorities had up to the time been slow to attach serious importance to the explosion engine vehicle for military purposes. And for some years after that the awakening to importance was a very slow process. Something was done to insure the availability of goods-carrying wagons by a system of subsidies, but nothing was done on any practical lines to develop the idea of conveyance of troops in war by speed vehicles on the road. One trial was made, at the instigation and by the organization of civilian enthusiasts, when a successful experiment was carried out in the conveyance of a body of troops from London to Brighton by motor car.

A critic at the time disposed of the subject by saying that, of course, the railroad furnished the best and most rapid means for conveying troops over all distances too great for marching. However, the railroad has these disadvantages: the expedition cannot, in all likelihood, be delivered at a railhead which is the most advantageous in the special circumstances. Again, the enemy knows that the line used is the only railroad available.

With motor transportation, a staff officer, meeting a column at a fork of roads, may cause alteration of direction, and the power to do this—a thing impossible in most cases on a line of railway—might be of infinite value in bringing special reinforcements to a spot where the action of the enemy might call for support to a particular part of the line.

Further, in the case of the autocar, the eggs are in many baskets, while in trains they are in few, or in a single one.

The German railroad system within German country, being laid off strategically to give facility for moving troops laterally in any required direction, gives to the General Staff great advantages as long as the region of combat is near the German frontiers. But as they advance, they part with these advantages to a marked degree.

On the other hand, the possibilities of rapid road transit of troops have been demonstrated in the present war. It has been found to be "good business" to commandeer thousands of vehicles for use in conveying soldiers. When the Germans were pushing their way up northwards to outflank the left of the Allies, and so make an opening for a march on Calais, a whole British brigade was carried northward in motor omnibuses. Then there is the well-known instance of the Paris taxicabs at the Battle of the Marne. In South Africa, De Wet, who was out to incite the burghers to join his force, was run down by motor cars.

As regards transport, motors have revolutionized it. And they have rendered incalculable service in the carrying of sick and wounded. One car brought no less than 200 wounded from the front in its first week of work. A remarkable case is given of a motor ambulance carrying 144 wounded in one night and 235 in 24 hours.

General and staff officers can bear witness to the advantages of conveyance by power vehicles. And in actual combat, armor-plated autocars constitute real mobile forts.

The motor bicycle with sidecar is also proving itself a highly useful aid in the field, a machine gun being carried behind a steel shield.

The power vehicle is in regular use for the conveyance of the heavy ordnance now employed in the field. In some cases the back and front wheels are coupled together by a chain loop passing over both, the chain engaging in sprockets on the rims of the wheels. On the outside of the chain there are a succession of broad discs, which may be compared to feet, and which support the vehicle by their broad surfaces extending below the wheels and along the chain when it is between the wheels. Thus the *pedrail*, as it is called, prevents sinking in soft ground, and also skidding.

[Army Auto Trucks for Mexico. *Army & Navy Register*, July 1, '16. 600 words.]

The War Department is negotiating for the purchase of about 1800 auto trucks. Deliveries have been delayed due to prior European war orders, and the national defense law of June 3 may have to be invoked.

**MOTOR TRANSPORT—Continued**

It is proposed to purchase enough motor trucks to equip 52 companies of 33 trucks each. The trucks are about equally divided between the 1½-ton and 3-ton types. If serious fighting occurs, ammunition trucks must be provided, and all transportation arrangements must be independent of the railroads, which would be thoroughly interrupted and take a long time to restore.

See also

**AUTOMOBILES**

**HORSES—USE OF IN WAR**

**MACHINE GUNS—MOTORCYCLE TRANSPORT OF**

**SANITARY SERVICE — TRANSPORTATION OF SICK AND WOUNDED—MOTOR AMBULANCES**

**WATER SUPPLY—BY MOTOR TANKS**

*United States*

[Report of the Quartermaster General. *Army & Navy Jour.*, Dec 25, '15. 1000 words.]

(The report covers all activities of the Q. M. Corps. Only certain points are discussed.)

The U. S. Army possesses 88 motor trucks, 29 motor cycles, and 3 motor ambulances. Records of performances have been kept, and it appears that motor transportation is reliable, even over difficult roads. A truck of 1½ tons capacity is considered most suitable for field service.

An organization for motor truck companies is proposed and shows a total personnel of 37 each for motor truck, motor car, and motor cycle companies.

Current experience indicates that motor trucks are practicable in the division supply trains and ammunition trains. About depots and on the lines of communication, it is contemplated to use trucks, tractors and trailers. Tractors and trailers are economical when road conditions are good. Trailers resulting from converted escort wagons have proved unsatisfactory.

[Army Transportation in Mexico. *Army & Navy Register*, Mar 25, '16. 200 words.]

The transportation problem in the movement of troops into Mexico is a difficult one. Already about 1200 horses and 250 pack mules have been purchased. In addition 27 White, 27 Packard and 54 Jeffery one and one-half ton motor trucks, three 600-gallon White water trucks, 23 Studebaker water wagons, 12 trailers, 20 motor cycles, and 22 motor ambulances have been bought. Bids are to be opened in the New York quartermaster's office, March 30, for from one to one hundred motor trucks.

[Note. *Army & Navy Jour.*, Apr 1, '16. 300 words.]

In less than 22 hours after the receipt of an order for 27 motor trucks, a special train of 14 steel freight cars and one Pullman left the Packard factory at Detroit, carrying the trucks and 33 employees who had volunteered

for duty with the transport service. A special night shift was at work on the order two hours after it was received.

[Note. *Army & Navy Jour.*, Apr 8, '16. 200 words.]

Including latest order by the New York Depot Quartermaster for one hundred trucks, the government has purchased over three hundred 1½-ton motor trucks in the past 60 days. Others will be ordered as and if needed. Five 600-gallon tank trucks have been ordered from the Four Wheel Drive Auto Co., of whose trucks over 1000 are now in use in Europe.

[Our Army's Transportation Needs. By Capt. Gordon Johnston, U. S. Army. *Motorists' Magazine*, Apr, '16. 6700 words. Illus.]

The problem of army transportation is a serious one, in which motor transport is an important element. The automobile engineer should be familiar with the army's needs in order to be prepared to supply them in the event of war.

The public is mainly interested in the fighting man, but his effectiveness would soon cease without the work of the supply services behind him. Formerly war was between armies. To-day it is between organized nations, and industrial efficiency may win.

In Europe to-day almost the entire work of transportation from railhead is by motor. To give some idea of the extent of the transportation problem, the example of a division will be taken. This is the administrative and tactical unit, and comprises 22,665 men, 4463 horses, and 2912 mules. The daily march averages 12½ miles, and the road space is 15.4 miles. (Follows a description of the difficulty of deploying a division in action.—Ed.)

The daily supplies of a division weigh 175,000 lbs. The net cargo in the supply trains of a division, exclusive of pack trains and certain artillery ammunition, is 2,143,000 lbs., something over a thousand tons. These supplies and the regularity of renewal are essential to the well-being and morale of an army.

Lines of communication comprise the base section, where supplies are accumulated and forwarded by rail and boat; the intermediate section, comprising the transportation routes to railhead; and the advance section, where is found the great problem of the daily renewal of the supplies expended, amounting as stated to 175,000 pounds for a division. The division supply train carries two days' food for the men and two days' forage for the animals. The division train transports supplies from the refilling point to the distributing point, whence distribution to the troops is made by the ration and field trains. (The division field train and loads are here given in brief from F. S. R.)

On wagon transportation, capable of a daily movement of only 18 miles, a division has a very limited radius of action from railhead.

Ammunition expenditure, both artillery and small arms, is enormous, and our calculations will have to be revised and transportation provided accordingly. The daily expenditure per man for small arms ammunition, formerly calculated at 240 rounds, will now have to be calculated at 1000 rounds per day in action. We have four machine guns per regiment; the Germans have 48.

For efficiency in supply, proper organization must be had in the transport. In motor transport, the unit is the truck, its driver and his helper, and the best truck for general purposes appears to be the  $1\frac{1}{2}$  ton truck. These units must be organized into companies. Companies must be limited to the number of trucks that can be properly supervised by one man, and also to the number that can be properly served by one supply and repair truck.

We have no means of controlling the design of trucks as is possible where trucks are subsidized, as in Germany. There all truck manufacturers are required to standardize parts, which greatly facilitates repair and maintenance. We can standardize in a way by ordering complete units from one manufacturer.

In addition to the supply and repair truck, arrangements must be made for shops where more extensive repairs can be made. The design of the special cars like repair and fuel cars should be studied out by manufacturers.

The most convenient and efficient division supply train is made up of two units, each comprising:

- 60 baggage trucks,  $1\frac{1}{2}$  ton;
- 3 fuel supply trucks;
- 3 repair trucks;
- 1 office truck;
- 4 high-speed cars for officers;
- 8 motor cycles.

This corresponds to an organization of squads of five trucks, two squads to a section, two sections to a platoon, and three platoons to a company, with a personnel of a captain, three lieutenants and 154 men.

The question of preparedness, of the obligation of the citizen to serve his country, is agitating many to-day. The obligation is not necessarily to serve under arms. There are many other duties to be performed in war. The problem of motor transport must be solved by automobile men. A series of tests should be adopted which would insure a satisfactory motor transport car.

[Civilian Motor Trucks as Army Supply Trains. By Joseph Brinker. *Scientific American*, Apr 22, '15. 1800 words. Illus.]

(An account of a trip by six heavy motor trucks fully loaded from New York City to New City, N. Y., thirty-two miles, and return. Five of the trucks were  $6\frac{1}{2}$  tons capacity and one of  $5\frac{1}{2}$  tons. The trip was made in a heavy snowstorm and the roads were bad. One truck acted as repair truck, and one as commissary truck. The test demonstrated the ability of the large capacity trucks to do certain of the army transportation to advantage,

amounting to all but 15% of the work. Five to seven per cent. grades were negotiated, and the average speed was 6.2 miles per hour. The small amount of cross-country work would have to be done by smaller trucks. Army observers were favorably impressed by the test.)

[Note. *Army & Navy Jour.*, Apr 15, '16. 150 words.]

In a test at Fort Miley, Calif., the 13th Co., C. A. C., was rushed to Half Moon Bay, distant thirty-eight miles, over hilly roads, in an hour and a half. A 7-inch howitzer was moved to the same point in three hours, and was then ready for action in 15 minutes. It would have taken a day and a half to have hauled the howitzer with horses.

[Use of Automobiles in War. Report of the Army War College. *Army & Navy Jour.*, Apr 29, '16. 800 words.]

The European War will make a radical change in the transportation systems for our army. Both strategy and tactics will be affected by motor transport. The strategical mobility of troops has been increased, and they have been rendered less dependent upon lines of communication.

No special type of motor truck or automobile is recommended by the War College. France has taken what she could get in the way of motor transport, segregating vehicles of the same make as much as practicable. It is well to have each army provided with a single kind.

It seems to be generally conceded abroad that the trains corresponding to our field and combat trains should be horse-drawn, while the division, corps, and army trains are best constituted of motor transport.

Motor transport has been used not only to transport supplies, but also troops. It is particularly effective in moving troops to reinforce attacked points in the trench lines.

Repair parks are a new feature required by the extensive use of motor transport. The necessity is apparent when it is realized that each field army has not less than 2500 autos.

[New York to Plattsburg in Two Days by Armored Truck. *The Commercial Vehicle*, Sept 15, '16. 450 words.]

On Aug 30 at 4:28 a. m. a Mack armored truck left New York and arrived at the Plattsburg Training Camp on the 31st at 10 p. m., the total time elapsed between start and finish being 41 hours and 31 minutes. The actual running time was 22 hours and 13 minutes. This truck consists of a stock Mack two-ton, worm-driven truck chassis, fitted with an armored steel body capable of withstanding U. S. Army rifle or machine-gun fire and weighs about 9500 pounds. It cost about \$8000, exclusive of the armament.

On the journey it maintained an actual running speed of 14.7 miles per hour. There were 19 stops other than those for meals and sleep, and no serious mechanical trouble occurred.

**MOTOR TRANSPORT—Continued**

[The Army and the Motor Truck. By Rollin W. Hutchinson, Jr. *Review of Reviews*, Oct. '16. 6000 words. Illustrated.]

Military success depends upon sound direction, numbers and supplies. In movement and in supply the motor truck is a principal factor. Germany has put into the field 80,000 motor vehicles of all kinds. France 100,000, Belgium 6000, and Great Britain 50,000 to 60,000. Motor vehicles are used for every conceivable purpose.

Motor trucks saved Verdun. General Joffre considered it hopeless to attempt to hold Verdun, but General Herr evolved a plan for supplying munitions by motor truck, leaving the lone single track railroad to supply food. Every shell used in the defense of Verdun has been hauled by motor.

The motor truck is indispensable in the supply of large modern armies. In no other way could an army of 800,000 men be supplied on a single line of battle.

Motor transport has the following advantages: (1) superior speed; (2) ability to travel any length of time without rest; (3) large load-carrying capacity in relation to length of roadway occupied; (4) less vulnerability to bullets and even to artillery fire.

These qualities vary in value in different classes of service, but the invulnerability to bullets and the freedom from stampede makes the motor truck available for many services near the battle line, where animal transport could not possibly be used. Twenty-four motor trucks do the work of 54 service wagons and the fuel supply is a simple proposition in comparison with the forage for animals.

The United States Army owned 62 motor trucks on June 30, 1914. Little experimental work had been done. The Mexican situation (1916) brought about a condition where military operations had to be undertaken with sole reliance on motor transport.

Marvels were accomplished in the way of emergency deliveries. One firm delivered 56 trucks worth \$186,000 in eight hours. Thirty three-ton trucks ordered from another firm on Monday were on their way to the border on Tuesday afternoon. Seven hundred trucks under construction for the French Government were diverted to the border. (Other examples of quick delivery are cited.)

By Aug 1, 1916, 1050 commercial type motor trucks were in use on the Mexican border. Among these were tank trucks for fuel and water and repair trucks. No armored trucks were ordered, but most of the F. W. D. trucks have steel bodies that resist rifle bullets. No ambulance trucks or anti-aircraft gun trucks have been used.

A truck company (1½-ton trucks) consists of 27 ordinary trucks and one repair truck. The aero squadron uses 1½-ton trucks with light trailers.

On June 30 the War Department ordered 1958 additional trucks to be supplied on call during the year. They are of ordinary 1½-ton type, 2- and 3-ton F. W. D., and experimental 3½-ton and 5-ton types.

The Mexican operations have tested all phases of motor transportation. The roads were very bad, and everything, including water, had to be carried. Both civilian and enlisted drivers were used. During the penetration period, each truck company parked its machines at night in a hollow square, under guard. On one truck of each company, a machine gun was mounted to fire all around, and a squad of 12 to 15 soldiers was carried on this truck.

Immense repair shops have been established at Columbus, N. Mex., and at Fort Bliss, Tex. Commercial trucks proved well suited for military uses. Certain modifications, however, are desirable, such as larger engines, lower gear-ratios, large ground clearance, greater accessibility of mechanism, larger radiating capacity, larger number of speeds, standardization of carburetors, and standard nuts, bolts and parts.

The four-wheel drive (F.W.D.) and steer truck is most satisfactory for hard tractive conditions. (Specific cases of movement are cited.)

The service has been very severe compared with any commercial use, but the trucks have stood the work well.

The tires most used were the demountable solid rubber type, to facilitate replacements and renewals. The pressed-on tires gave greater mileage, but could not be used on account of impossibility of changes. Perhaps we shall see developed a heavy-duty type of puncture-proof pneumatic which will double the speed of the army mechanical transport.

The experience on the Mexican border leaves no possible difference of opinion as to the necessity of motor transport, and provided a test that might otherwise have been delayed for years.

[Army Truck Train Makes Record 858-Mile Haul. *The Commercial Vehicle*, Oct. '16. 475 words.]

United States Army Truck Train No. 13, composed of 31 three-ton Riker trucks, has just made a new record in transportation by covering the distance from Columbus, N. Mex., to San Antonio, Tex., in 13 days of actual running time.

This trip was made over a roadless country, in which the alkali dust did its best to injure the truck mechanism and make it disagreeable for the drivers. The greater part of the road was across the desert, whose only tractive surface was a thin, sun-baked layer over the bottomless sand. At many points roads had to be built from firewood carried on the "chuck trucks," i.e., those that carry the subsistence for the train. In all, about 50 miles of roadway were built during the run. This took about two days; in addition, two other days were spent in El Paso, making the total elapsed time 17 days.

Road-making was not the only difficulty encountered. Frequently the entire train had to ford streams, flooded by the torrential rains on the border, and to pull through long stretches of gumbo mud. Under such condi-

tions, the record made is commendable, as appears when compared with the work which would have been accomplished by mules. These would have required 47 days to make the trip.

The average run per day was 66 miles; the best day's run was 126 miles. On reaching San Antonio every truck was in good condition.

—Fuel for

[Germany's Motor Mixtures. *Scientific American*, Oct 7, '16. 200 words.]

Owing to shortage of gasoline in Germany, other motor fuels had to be sought. It is stated that the one most used is a mixture of alcohol and benzol. Experiments are quoted showing results from 4.66 miles at 42 m. p. h. on one pint of equal parts of alcohol and benzol to 3.72 miles at 36 m. p. h. on a mixture of one part benzol to five of alcohol. Pure benzol gave 3.79 miles at 42 m. p. h., and gasoline gave 3.60 miles at 44 m. p. h.

—Of Artillery

See also

FIELD ARTILLERY—MOTOR TRANSPORT

—Of Machine Guns

See

MACHINE GUNS—MOTOR TRANSPORT OF

—Of Troops

[Automobile Transport Experiments. *Army & Navy Jour.*, June 10, '16. 500 words.]

Two automobile tests have recently been made under the direction of the General Staff. At San Antonio, a motor truck company of 28 three-ton trucks moved a thousand fully equipped men, including machine-gun company and the attached sanitary troops. The troops rode standing, about 35 men to each truck. It took 50 seconds to load the regiment.

The other experiment was made at San Francisco. In this 21 five-passenger and 5 seven-passenger cars, two  $\frac{3}{4}$ -ton trucks and one 5-ton truck were used. The 5-ton truck was used to carry a 7-inch howitzer, an experimental cradle being used to secure the howitzer. The trip of 36 miles was made in 1 hr. 47 min. going, and in 1 hr. 59 min. returning for the troops. The howitzer required 3 hrs. 17 min. going and 4 hrs. 15 min. returning. The howitzer (or a 5-inch gun) can be loaded on a truck in from 30 to 45 minutes, and unloaded and prepared for action in 20 to 25 minutes.

[Moving a Regiment by Motor. *Scientific American*, June 17, '16. 1500 words. Illustrated.]

In a mobilization at Sheepshead Bay, May 21, an attempt was made to collect data concerning transportation of troops by motor vehicles. The experience of one regiment (47th) is summed up in the following recommendation: (1) Trucks of one pattern or divide into sections; (2) an officer to each truck to prevent racing (1—Ed.); (3) electric trucks are too slow; (4) 10 to 12 miles is too slow, requiring low gear and consequent heating;

(5) fast car for officer in charge; (6) master mechanic and assistants in fast truck; (7) every truck conspicuously numbered; (8) officer and messenger at rear of column; (9) trucks two lengths or 30 feet apart; (10) two-ton trucks are large enough.

[Army Trucks Move 2000 Men 200 Miles in a Day and a Half. *The Commercial Vehicle*, Sept 15, '16. 225 words.]

An experimental trip in the transportation of men by motor trucks was made in September; a truck train left Eagle Pass on the 6th, and arrived at Camp Cecil E. Lyon—200 miles within 36 hours. Four companies of trucks were used, each company being made up of 33 trucks. Of these, 30 in each company were for the transportation of troops. Each truck carried 20 soldiers, leaving the remaining 34 for equipment and kitchens. For shorter distances, 35 men can be crowded into each truck. The cost of this experiment is to be tabulated so that the figures can be compared with a like movement by rail. The number of men carried was 2000.

—Of Wounded

See

SANITARY SERVICE—TRANSPORTATION OF SICK AND WOUNDED

—Repairs and Renewals

[War Repair for Cars of 500 Different Types. From the *London Times*. *New York Times*, May 28, '16. 1000 words.]

Great Britain has a great motor vehicle depot, connected with which are repair shops and stores of equipment. All motor vehicles for the British Army pass through this depot. Some 400 are received and 300 sent out each week. There are repairs for 500 different types of vehicle, 156 kinds of solid tires, and 679 sizes of ball-bearings. In spare parts, 10,000 items are handled each week. Only the most perfect system permits such a plant to run efficiently.

—Repair Trucks

[Auto Repair Trucks for Field Service. By Victor W. Pagé, M.S.A.E. *Scientific American*, Sept 9, '16. 2500 words. Illustrated.]

The maintenance of motor transport service requires prompt repair and salvage of wrecked or damaged trucks. Hence there have been developed repair trucks of various types.

There are four classes: (a) in which each truck is a unit in a general repair train. Such a train constitutes a general repair depot; (b) a single truck which carries a complete outfit of tools, but no spare parts for any particular make of truck; (c) special repair trucks intended to serve one particular make of truck; and (d) a wrecking truck, intended mainly to get stalled trucks started, and provided with tools for making emergency repairs only.

Trucks of type (a) are not described. A type (b) repair truck has a separate gasoline engine to operate its machine plant, which comprises a lathe, drill press, bench grinder, and breast drill. A bench cabinet carries a miscellaneous equipment of fire pots, blow torches, hand grinders, etc.

**MOTOR TRANSPORT—Continued**

Blacksmith and carpenter tools and an oxy-acetylene outfit are carried. Type (c) trucks carry forge and anvil, blacksmith outfit and bench equipment. The rest of the load is spare parts and special equipment for the particular type of truck served. Type (d) trucks have winches and wire and manila rope, and can haul themselves or other trucks out when stuck. Their tool equipment includes an oxy-acetylene outfit, crowbars, shovels, sledges, etc.

**—Subsidy of—Subsidized Types**

[Foreign Motor Truck Subsidy Requirements. By Victor W. Page. *Scientific American*, Mar 18, '16. 2000 words. Two drawings.]

In order to have motor trucks available, and at the same time to avoid the peace expense of purchasing outright a large number, foreign governments have devised a subsidy plan whereby owners of motor trucks, conforming to standards suitable for military use, receive substantial assistance in the original purchase, subject to delivery to the government at a fixed price in time of war.

The British government specified two types—Type A, of 3-ton capacity, and Type B, of 1½ tons. The specifications for the two classes in brief are:

*Type A. Tires*, 35.4 in. x 4.72 in. front and double 41.33 in. x 4.72 in. rear; *wheels*, steel, 28.25 in. front and 34.724 in. rear; *engines*, under bonnet on front of chassis, accessible for inspection, with 4-cylinders, minimum bore 4½ in., and 30 hp., cylinders cast in pairs, mechanically operated valves, enclosed stems, automatic speed governors, pump operated cooling system; high tension ignition, tubular radiators and positive-driven pump lubrication with supply for 200 miles; *transmission*, four speeds forward and one reverse, geared at least 5 to 1 on high, shaft drive, with torque members and radius rods; *hand brake* to push to set, operating on rear wheel hubs; *foot brake*, to operate on propeller shaft; either brake to hold vehicle on 1 to 5 grade; *wheel base* not less than 156 inches; *fuel tanks*, 30 gallons; gasoline consumption not greater than 1 gallon to 40-ton miles; must climb a grade of 1 on 6 fully loaded, and have two towing hooks front and rear.

*Type B. Tires*, 33.2 in. x 3.93 in. front and double 40.55 in. x 3.93 in. rear; *wheels*, steel same dimensions as Type A; *engines*, 4-inch cylinders and 24.8 hp.; *wheel base*, minimum, 126 inches; remaining requirements same as Type A.

The French specifications cover three classes, one of 4408 pounds carrying capacity, one of 3306 pounds, and a separate class 3306 pound capacity with four-wheel drive. The specifications are in less detail than the British, and cover about the same points.

**—Trailers in**

[The Economy of Tractor and Trailer. By H. S. Dye. *Automotive Engineering*, Sept 16, '16. 1770 words.]

With the realization of the great advantage of the motor truck over the horse also comes

the realization that it is neither necessary or desirable to place the entire load on the four wheels of the truck itself. This has worked out into using a two wheel, iron wheel trailer and thus saving by reducing the wear and tear on the rubber tires of the truck. This plan has its limitations because the truck must be very strong to carry its load, and heavy to stand the strain of pulling the trailer. Any truck can haul many times more, when part of the load is placed upon a trailer or trailers. The next question is, what is the total tractive power of a truck? A chart has been constructed that shows the tractive force in pounds of any truck when the bore and stroke of the motor, the gear-ratio and the diameter of the rear wheel are known. For a truck with 4¾ in. x 6¼ in. cylinders, 12 to 1 high-gear ratio and 36-in. wheels, the tractive force is 1040 lbs. or the truck can pull about 5 tons, as 200 lbs. is sufficient to pull 1 ton. On low gear the truck could pull much more. The figures show that a 3-ton truck can haul 15 tons on city streets and 5 tons in country work. This shows that the capacity of the truck will be about trebled by the use of two trailers. A 3-ton truck costs about \$3700, complete; trailers would add about \$2000. Taking into consideration the decrease in speed and the increase in time necessary for loading and unloading, it is found that a truck will produce twice the amount of work at the same cost when trailers are used.

**—Use of in European War**

[Notes of the War. *Army & Navy Jour.*, Dec 11, '15. Quoted.]

"The French made the first extended use of motor transport in the war, says the Berlin *Fremdenblatt*. At the outbreak of hostilities the French General Staff seized 500 Paris motor buses and sent them off, packed with soldiers, to the Belgian frontier. The next day a fleet of 1,000 motor buses and taxicabs was improvised. It is estimated approximately by German military authorities that the several belligerent powers made use of 250,000 motor transport wagons in the first week of the war, disregarding the pleasure cars which were commandeered for emergency use. This gives one an idea of the immense part played in modern operations by the gasoline motor."

[Automobiles in the European War. *Army & Navy Jour.*, July 1, '16. 800 words.]

In a paper presented before the Society of Automobile Engineers, W. F. Bradley states his belief that the Allies have 60,000 automobiles of all kinds in use on the western front. There are 24,000 American trucks in the service of the Allies. Although the desirability of using motor transport had been recognized, no one foresaw the extent to which they would be used. No one dreamed that the European manufacturing facilities would be inadequate to supply the requirements, yet almost immediately after the outbreak of war the French began buying automobiles in the United States. Owing to the number required, the future problem must be worked out on the basis of



the commercial truck. There will be some military vehicles, but the bulk of the motor transport will be done with commercial trucks. It is therefore a problem of directing commercial design to types that will answer military requirements. The 5-ton truck is too heavy, and the bulk of the work is best done by a 3½-ton truck.

Some six-, but mainly 4-cylinder, engines are used. All engines are under a hood, and under-the-seat engines are no longer used. The internal combustion engine has proved its superiority to gasoline-electric or steam traction. Steam tractors are much used around camps in England. Some tire trouble has developed.

The usefulness of the armored motor car has been much curtailed by the development of trench warfare. They are useful only in open fighting. The best type is a powerful touring car chassis, with body composed of plates .3 inch thick.

One effect of the war has been to bring out the extensive use of trailers. The Allies have not been forced to alternative fuels, such as benzol, alcohol, and kerosene. These have been used in the manufacture of explosives, but it is certain that the French requirement of ability to operate on benzol will be insisted on after the war, and alcohol will probably be widely used as a fuel.

#### —Use of in U. S.-Mexican Expedition, 1916

[News and Comment. Motor Transportation in Mexico. *Army & Navy Register*, June 3, '16. 300 words.]

Reports from Mexico indicate a growing preference for a heavier or larger motor truck than the 1½-ton vehicle hitherto purchased. Efficiency and economy call for a 3-ton truck, and it is advantageous to use as many as 33 instead of 27 trucks in a motor-truck company, one being a kitchen truck, one a repair truck, and one a truck for parcels and mail.

The operating cost of a 3-ton truck is only 25 per cent. more than that of a 1½-ton truck, and it requires less in the way of repairs.

The speed being practically the same, the larger trucks deliver a larger amount of supplies with a smaller personnel. The objections to the larger trucks have been their inability to negotiate all grades, and the danger to bridges. The engineers can strengthen the bridges if necessary.

[*Army Motor Trucks in Mexico. Army & Navy Register*, June 24, '16. 1500 words. Illustrated.]

In a report to the Q. M. General, Mr. Charles P. Daly, chief clerk of the Q. M. G. O., gives his observations relative to motor transport in Mexico. Repairs to roads operate to lengthen the life and reduce repair costs of automobile trucks. The efficiency of the motor transport in Mexico has been secured by excellent organization. On its return after each trip, the trucks are overhauled and reloaded.

Most of the "road troubles" are due to

inexperienced drivers, but experienced drivers cannot always be secured. One or two trips may be enough for the expert civilian driver, and it takes time to train soldiers. They stay, however, when they are trained. Inexperienced drivers averaged 3 to 3½ miles per gallon of gasoline, while experienced drivers averaged 7, with the balance in repair costs against the inexperienced drivers as well. Distribution of gasoline is best accomplished by using 600-gallon tanks on trailers instead of using drums. With the latter, the waste was 20%.

It is suggested that both 1½-ton and 3-ton trucks be used. The latter are slower, but deliver double the cargo for 1½ times the cost. The 3-ton trucks are especially good on short hauls. A suggested truck company consists of 36 trucks and a total personnel of 52.

[Solving Questions of Transportation in Mexico. Editorial. *Army & Navy Jour.*, July 1, '16. 800 words.]

Transportation of supplies to the expeditionary force in Mexico is furnishing valuable data on the transportation problem. The use of the railroads was denied by Mexico, and animal transport was out of the question on account of the distances involved. Motor transportation was the answer. There are now operating into Mexico sixteen motor truck companies. Including those used in supplying units on the border, about 600 trucks are in operation. The personnel was untrained, and the country waterless, treeless, and roadless, but the difficulties have been overcome. There is danger from snipers, and no man is allowed to leave camp when a train is parked for the night.

The line of communications is over 300 miles in length, and stations are 15 to 30 miles apart. The results have been entirely satisfactory.

[Substituting Gasoline for Horseflesh. By Victor W. Pagé. *Scientific American*, Aug 5, '16. 2700 words. Illustrated.]

The punitive expedition into Mexico could hardly have been undertaken without motor transport. Without it an immense number of animals must have been purchased, or the railroads seized.

The European war had taught manufacturers and military authorities the requirements of military motor vehicles. Desirable qualities are: four-wheel drive and steer; good ground clearance; strong frames; short turning radius; standard tread; powerful brakes; increased gasoline capacity; force feed-water circulation; and standardization of parts. Special trucks are required for special purposes, such as tank trucks for carrying water, gasoline, and oil; searchlights, armored cars, wrecking trucks, etc. Few of these have been used.

Nearly all makes of motor vehicles were bought, and marvels were accomplished in quick supply. One manufacturer turned out 56 3-ton trucks, value \$186,000, in eight hours.

The roads over which this motor trans-

**MOTOR TRANSPORT—Continued**

port operates are very bad. The record from Columbus, N. M., to Casas Grandes, Mexico, 104 miles, was recently lowered to ten hours' actual running time.

Drivers have been secured from various sources, such as college graduates, from the factories, taxicab and motor-truck drivers, but as a rule the enlisted drivers are most satisfactory.

Much is expected from the new attachable flanges which enable a motor truck to run on a railroad track. On a recent trial a distance of 93 miles was covered at an average of 19 miles per hour by a truck so equipped.

[The Automobile in Modern Warfare. By M. L—k. *Svensk Artilleri Tidskrift*, parts three and four, '16. 13,500 words. Four illustrations.]

Of all the technical aids that in the present world-war have been available for the fighting armies, perhaps none has taken as prominent a place as the automobile.

These may be divided into two classes, passenger automobiles and freight automobiles, or motor trucks. Before the outbreak of the war, Germany had adopted two classes of passenger automobiles, a larger and a smaller—the first for headquarters and staff use, the smaller for telegraph, reconnaissance, patrol, etc. A certain length and width of chassis, track width, weight, horsepower, speed, etc., were required, and as complete a standardization as possible for the important parts of the machines in order to supply reserve parts readily. Probably other countries also required similar conditions before the outbreak of the war.

The need of freight automobiles for military purposes had been recognized by nearly all the countries. As it was also recognized that it would be impracticable for any government to obtain and keep on hand anything like the number of such vehicles in peace times that would be required in case of war, recourse was had to a system of bonuses for the owners of the prescribed kind of motor trucks. This was done not only to insure obtaining in event of war a certain number of suitable motor trucks, but also for fostering the manufacture of these trucks and standardizing their type.

Italy and Russia had not introduced the bonus system and possessed very few motor trucks before the outbreak of the war. Germany, Austria-Hungary, France and England on the contrary had introduced this system, the first named to a greater extent with more rigid requirements and greater bonus than any of the others. Germany had expended from 1908-1914 about 6,000,000 marks, (\$1,429,000) in bonuses for this purpose. England, on the contrary, had expended the least and as a consequence at the outbreak of the war not only was the supply insufficient but of unsuitable quality. The kind of trucks used depends in great measure on the character of the roads to be traveled:—single trucks, trucks with trailers, and motor trains.

By granting bonuses, the state insures the presence in the country of a large number of motors of suitable type and the right to requisition them during peace maneuvers or war. The state also by this means obtains an influence in the manufacture of motors, and can arrange for the production of such as are most suitable for military purposes and of uniform type. This also insures an adequate supply of trained chauffeurs and contributes towards keeping the roads in good condition. Another question that requires special measures is the keeping of a sufficient supply of rubber for tires, and of gasoline or other means of propulsion such as alcohol or benzine.

The Germans first of all saw the necessity of special automobile troops, and as early as 1901 organized an automobile command in Berlin under a captain, which was later increased and became a school for the training of drivers and mechanics. Germany had also a volunteer automobile corps.

Not until the latter part of 1913 did the automobilists in France receive military organization. The duties of this organization were to arrange training courses for the personnel belonging to the active army and the reserve; to supervise the registered automobiles in the country, especially those given a bonus; to purchase test automobiles and others needed for the army with the necessary appurtenances; to take charge of the supply of army automobile material; to make necessary tests and to follow the development of the automobile industry; and at mobilization to organize the army's different automobile formations. This organization had hardly time to begin its work before the outbreak of the war. France had no volunteer automobile corps.

In Austro-Hungary, the military automobile department was organized in 1913, and a volunteer automobile corps was in existence, with subdivisions in Austria and Hungary.

In England there were first organized four automobile companies, which were gradually increased to sixteen "mechanical transport companies" and a depot company. No other organization existed at the outbreak of the war, and there was no volunteer automobile corps.

In Russia, before 1912 there was only a school company (in Petrograd), but during that year five automobile companies were organized to be used on the western frontier, and in 1913 six additional companies were ordered, but it is not certain that these were ready before the beginning of the war. Owing to pressure from the government, several volunteer automobile companies were organized immediately after the declaration of war.

*The Automobile in War*

It may be of interest to see how the country—Germany—that most rationally used the automobile, minutely prescribed how it was to be used in regulations published before the outbreak of the war. In the field the automobiles were divided into passenger automobiles (large and small), omnibuses (in-

cluding reserve ambulances), army auto-trucks, and freight trucks, cavalry freight trucks, ambulances, and motorcycles. A table is given, showing the speed and length of a day's march that may be expected of the different kinds of automobiles—over level, hilly and mountainous roads.

Passenger automobiles were largely used to transport officers, for reconnaissance, for transmitting orders and reports, for signal service and communication. The field telegraph and aero service also made extensive use of them. These passenger automobiles were in great numbers received from the volunteer automobile corps, and those not obtained from this source were requisitioned from private owners, firms and factories. These automobiles were used not only for military service but for post and relay service: that is, for carrying on a regular traffic between certain points. For example, there was organized a service (for the transport of persons, mail, despatches, etc.), between Berlin and the Headquarters of the Army, and during the first months of the war, between Berlin and Cologne, Berlin and Frankfurt-on-Main, and Berlin and Stuttgart.

It is impossible to estimate the total number of passenger automobiles in use by the different warring nations, especially as the number varies from time to time. At the end of 1915 Germany probably had about 10,000; Austro-Hungary, 3000; and France and England, according to an estimate, 50,000. The latter probably included freight trucks, and is very likely overestimated.

The passenger automobile was also used to transport larger bodies of troops. In order to transport troops rapidly through Belgium for a sudden surprise attack on France, the Germans organized a special volunteer automobile corps, consisting of 170 passenger automobiles and 30 auto trucks. Their first task was to transport troops, especially engineer troops, to put damaged roads and bridges in order, and then to transport ammunition and food and take back the wounded, etc. In the advance against Paris, its principal task was to furnish the advancing cavalry with ammunition and food. Before, during and after the battle of the Marne, it was used extensively to move troops from one position to another. After the beginning of the position warfare this corps was mainly used for the transport of wounded back to the base hospitals. Later it was gradually disbanded.

In the French armies the passenger automobiles were also very extensively used, especially during the German advance on Paris. Just before the battle of the Marne, Gen. Joffre requisitioned 6000 cab autos in Paris, and transported by means of them, in one night, 70,000 men from Versailles to Meaux. This movement had an important bearing on the result of the battle. Early in the war 1100 auto busses were requisitioned in Paris for the transport of troops. These were later used to transport meat to the front, as by slight modification they were very suitable for this purpose.

### Freight Trucks

To return to the before-mentioned German regulations, this portion of an army's automobile system was divided into a commanding officer, supply auto columns, cavalry freight columns, hospital auto formations (including ambulances), supply parks, auto trucks for the fortresses, and also auto truck formations at the home stations. The duties of the commanding officer are given in detail and what each of the columns, etc., is to transport. The German auto trains transport in general four to six tons on the auto truck and two tons on the trailer, or 50 to 55 soldiers standing or 40 sitting. The number of freight trucks in use at the end of 1915 is estimated at:

Germany about 15,000.

Austro-Hungary about 3000.

France about 15,000.

England about 3000.

According to another and later statement there are now used by the warring powers, in round numbers, 200,000 automobiles, of which Germany has 60,000; France, 70,000; and England, 20,000. Of these about 15 to 25 per cent. consist of freight trucks and auto busses. This number has been calculated to represent a money value of about \$674,000,000, and the value of the material consumed in propelling them during one year, \$27,000,000. One year's supply of rubber tires for these vehicles has a value of \$197,000,000. The replacing of worn out automobiles corresponding to 20 per cent. of the supply during one year, amounts to \$137,000,000 and the cost of reserve parts and repairs during the same period amounts to \$27,000,000.

The German freight truck has a hood over the front seat which has seat room for two or three persons, and the body of the truck is protected by a cover of water-tight cloth stretched over iron bows. The trailer is four-wheeled and also has a hood over the front seat and roof over the body of the truck. The trailer can also be hauled by team.

Austria has also adopted a freight truck with trailer, similar to the German but lighter, it being considered that one weighing two to three tons with a trailer that can be uncoupled when desired is better.

The English army had very few motor trucks at the beginning of the war and, besides requisitioning such as could be obtained from private parties, factories, etc., they imported a large number from America, principally four to five ton trucks. These were found to be rather too heavy, however, and had the additional disadvantage of being of many different types, hence it was difficult to keep them in repair.

The French, owing to their bonus system, were able to obtain a great number of auto trucks at the beginning of the war. These were unfortunately of varied types and from many different factories, and as many of the automobile factories had to be used later to manufacture ammunition and other war material, many motor trucks had to be obtained from America. One order during the spring

**MOTOR TRANSPORT—Continued**

of 1915 consisted of no fewer than 2540 two or three ton trucks, of which more than half were delivered within six months. Here they have also come to the conclusion that the best type of truck for military purposes is one of two and a half to three tons with a trailer.

*Special Types of Automobiles*

One of the most important uses of the automobile is to transport the sick and wounded, and for this purpose two types of ambulances were in use:—a light and a heavy, the former with a chassis like that of a large passenger automobile, and the latter more nearly like a motor truck, or omnibus, sometimes converted from such vehicles. One type of light ambulance has room on the front seat, which is covered by a hood, for two or three persons and the body, which is enclosed and covered has room for four or six litters:—two side by side and in two or three tiers, with a narrow passage way between. In addition to these, light two-wheeled ambulance trailers are used, each capable of carrying six litters and of which one or more can be coupled to the ambulance, depending on the condition of the roads. One type of the heavy ambulance consists of an omnibus chassis with covered body and windows on the sides. This can carry six stretchers and has room besides for as many as fourteen less seriously wounded able to sit up. This vehicle is electrically lighted and also heated when necessary. Temporary expedients have also been used to transform ordinary motor trucks and omnibuses into ambulances. Movable field operating rooms and hospitals have also been designed and used, as well as movable apothecary shops, radium and X-ray laboratories.

*Transportation of Heavy Artillery*

Specially designed motors were used for the transportation of heavy artillery, particularly the Austro-Hungarian 30.5 cm. howitzers. The gun itself was manufactured at the Skoda factories, but the automobiles for transporting it came from the Austrian Daimler factory at Neustadt. The battery of two pieces consist of three locomotive autos each pulling two trucks, besides the necessary ammunition train. The locomotive is very powerful, and both front and rear axles are coupled to the motor to increase the pulling power. The gun itself and the carriage for the same are transported separately, each on a four-wheeled truck with very strong and broad steel wheels, without rubber tires. According to one account, each carriage truck loaded weighs about 7000 kg. (over seven tons), and according to another account, the gun truck weighs 8500 kg. and the carriage truck 10,500 kg. The truck for the mortar bed, loaded weighs about 10,000 kg. According to one account this truck is a six-wheeled vehicle. This battery, in spite of its great weight has been transported over not only good roads but over poorer ones, for example in the Carpathians. Arrangements were made, by means of wire rope and

mounted on them are usually of small caliber. pulleys, to use power to pull the trucks over difficult places and up steep hills.

In France they have lately devised a motor transport for heavy guns.

It is reported that the Germans intend to transport their noted 42 cm. mortars by motors, which is quite possible by proper disposition of the weights.

*Armored Automobiles*

The requisites for a satisfactory armored car are great mobility in connection with sufficient armored cover for the armament, personnel, and vehicle, and also great rapidity of fire of gun or guns with which it is armed. It has been found very difficult to combine these requirements, since the car will be too heavy if it has sufficiently heavy armor, and no satisfactory car has yet been devised. France has at present three types of armored cars in use. One of these, manufactured by Schneider & Co., has an ordinary four cylinder motor and weighs about six tons. The chauffeur's seat, wheels and machinery are protected by armor, so that the machine looks like an armored chest. Behind the chauffeur's seat is a casemate, 2 m. long, 1.9 m. high and 1.7 m. wide, with place for six riflemen. On each side are four port holes in two tiers. They can be covered with small shields. To the rear is a similar port hole. The front seat and casemate are covered by a movable roof through which entry is made into the casemate.

Another armored motor car constructed by the same firm has a movable turret for a rapid fire gun instead of a casemate. Another French firm, Charron, has constructed a car similar to the above mentioned, but designed for machine guns instead of the rapid fire gun.

Accompanying Canada's second contingent was an armored motor battery consisting of six armored motors, each armed with a rapid fire gun, two freight motor trucks, one construction and repair truck, one large passenger car and six motor cycles.

Belgium, at the outbreak of the war, had doubtless the best organized armored automobile corps of all such organizations. It consisted of three armored passenger automobiles (for officers, reconnaissance purposes, etc.), ten armored cars, each armed with two 40 cm. rapid fire guns, two freight auto trucks for ammunition, one work shop auto, three trucks for tools and spare parts, one ambulance, one hundred bicycle riders and fifty motor cycle riders. The cars were only partially armored and therefore comparatively light and mobile.

Russia, Italy, Germany and Austro-Hungary are also using this weapon to a greater or less extent. Experience seems to indicate that machines weighing over three tons are not suitable owing to their small mobility. A speed of 50 km. per hour is considered necessary, also steering apparatus at both ends so as to avoid turning around, and two speeds for backing instead of one.

*Automobiles for anti-aircraft artillery* are also used to a great extent, owing to their mobility. The machines used for this purpose

are either light ones similar to passenger automobiles or light motor trucks, as the guns mounted on them are usually of small caliber. To protect the car from shock, a strut or other support is put under the gun carriage to take up the shock of recoil.

*Automobiles for the aero-service* are also used both to assist in moving the aeroplanes, their personnel, material for repair, etc., and also to transmit orders, etc.

Automobiles have also been used extensively to carry mail in the field from the railway stations to the troops. For this purpose ordinary automobiles have been used, and in some cases three-wheeled automobiles owing to their mobility. Also specially designed post autos or mail-cars are employed, in which the distribution of the mail can take place while they are in motion, as well as small cars similar to those used in cities. The number of post autos in use in the German army is estimated at 1000.

Automobiles are also used to transport *searchlights* and to furnish power for the same, for the transport of *field telegraph* material, for *wireless telegraph* with the automobile as power, and for numerous other purposes, even such as *movable laundries*.

## MOTORS

[The Testing Laboratory of the Automobile Club of America. *Aerial Age Weekly*, Aug 14, '16.]

Two classes of tests are made:

- 1—Official tests open to the public.
- 2—Confidential tests results not published.

The second class of tests are made for the manufacturers who wish to satisfy themselves concerning the performance of their motors with view of improving their product. A certificate is given with the result obtained for each official test. A small charge is made for the use of the apparatus, the labor and the materials furnished.

The apparatus includes two dynamometers, one for speeds up to 2000 r.p.m. the other for speed up to and above 3000 r.p.m.; both have capacities from three to 120 h.p. The mechanical losses in a motor, the fuel and oil consumption and the heat losses are all measured very accurately. The gas from the intake and the exhaust is analyzed, the temperature and pressure taken. Two motors are included in the equipment, a four and a six-cylinder, both automobile motors. In addition to motor tests, carburetor tests, transmission tests, and road tests are conducted.

See also

AERONAUTICS—MOTORS

## MOUNTAIN ARTILLERY

### —Firing Regulations

Chile

[Some Comments on the Tentative Firing Regulations for Mountain Artillery. By Captain Carlos Saez M. *Mem. del Ejército* (Chile), May, '16. 7400 words. Diagrams.]

(A technical study inviting attention to the changes necessary in the project, which is a translation of the German firing regulations

of Feb, '14. Some of the data referred to are the result of the firing conducted by the Chorrillos Regiment.)

See also

FIELD ARTILLERY—USE OF IN MOUNTAIN WARFARE

## MUNITIONS

See also

AMMUNITION  
POWDER

### —In European War

See

EUROPEAN WAR—AMMUNITION

EUROPEAN WAR—MUNITIONS AND MUNITION MATERIALS

### —Manufacture of

[Laboratories in War Time. By René Blactot. Translated from the French. *Field Artillery Jour.*, Apr-June, '16. 1600 words. Illus.]

(Note. A description of the tests and experiments in connection with cannon and ammunition as carried on at various ordnance work-shops and proving grounds in France.)

### —Manufacturing Facilities of

France

[Manufacture and Consumption of Ammunition in France. Anonymous. *Field Artillery Jour.*, Apr-June, '16. 1000 words.]

(Note. An English translation from "*Fremdenblatt*" of April 1, 1916.)

[The War Industries of France. By L. Lévy-Bruhl, French Ministry of Munitions. *Nineteenth Century*, July, '16. 6000 words. One table.]

To-day the entire strength of a nation must be used or the nation will perish in war. No sudden outburst of energy will suffice. What is needed is an adaptation of the whole nation to war. The millions on the battlefield must be assisted by the thousands in the factories.

Germany had to some extent foreseen the necessity of industrial mobilization, but even there the measures were inadequate. In France, industrial mobilization had to be improvised. About the end of August, 1914, munitions began to run short. Not only was there this need, but there was also need to match the German heavy artillery, and trench material was completely lacking.

The mobilization had largely paralyzed French manufacturers, and the moratorium assisted toward that end. But to re-establish these factories was a matter of life and death. France was divided between groups of manufacturers, and directors of large manufacturing and metallurgical establishments were placed at the heads of these groups, being nominated by the Minister of War. Each Head of Group was directed to take a census of manufacturing resources in his district and to take other necessary measures to obtain the maximum output. There were nine groups at first, subsequently increased to 15.

Generally, the Heads of Groups took up the orders in their entirety. The groups specialized, as in "75" shells, heavy shells, etc. The organization by groups was mainly adapted to

**MUNITIONS—Continued**

the manufacture of shells. They were soon replaced by an organization directed by the government. The problems were many. It was necessary to replace the losses of field artillery, manufacture heavy artillery, to manufacture material for the trenches, to create and equip a chemical war-industry, etc.

The situation in raw material was critical. The occupation by Germany of the provinces in the north and east deprived France of 70 per cent. of her coal and 85 per cent. of her iron-ore. Both had to be imported.

The manufacturers rallied patriotically to the service of the country, subordinating personal profit to the need of the state. Solution of the labor problem required the recall of a large number of skilled laborers from the colors, their services being more needed in the shops than in the field. Wherever possible civilian and female labor were utilized. It is hoped that women will soon constitute one-third of the labor employed in war industries. Even so, the labor problem is still difficult, and recourse has been had to foreign and colonial labor.

The success of the scheme depended upon the devotion of the labor itself, and the sustained and prolonged effort has borne fruit. But the difficulties multiply. More shells require more coal and steel. These must be imported and then transported. More explosive is required to fill the shells, and so the pressure is everywhere increased.

A table shows that the output, using as a unit the output at the beginning of Aug, 1914, is now 98 times greater in machine guns, 237 times greater in rifles, 35 times greater in field artillery shells, 54 times greater in heavier shells, and so with other items. These figures show the effort France has made, and how much has been accomplished under the tremendous handicap of lost coal and iron territory.

The British Navy has rendered services of the highest value, assuring the transport of matériel. England is now well on the road to a military reorganization. Such a profound transformation has required time.

*Great Britain*

[Britain as an Arsenal. *The American Review of Reviews*, Mar, '16. 750 words.]

(This article is the substance of an article in the *Edinburgh Review*, by Dr. A. Shadwell; and of an article in *The Quarterly Review*, by Mrs. M. G. Fawcett.—Ed.)

Never before has the supreme concerted effort demanded by war been so fully brought out and the inscrutable mystery of human conduct been so clearly posed as in this prodigious conflict of industrial nations. All the belligerent nations and even neutral nations are suddenly turned to purely destructive purposes with an ardor and energy heretofore unknown to civil life.

Next to the feat of the British Navy in practically wiping out German submarines, England's greatest feat is the creation of the system of war industry that exists to-day.

To see this in its entirety one would have to sweep the country. When England went to war only a limited number of armament firms were in position to operate. To-day, through the efforts of the Ministry of Munitions, a feat of organization has been accomplished of which England was thought incapable.

Women's professional and industrial activities have been changed more or less permanently by the demands of the hour, and in new lines of work they have shown a high degree of industrial efficiency. It is not likely that they will be excluded from the skilled trades after the war.

[Ammunition Supply. Great Britain. *The Spectator*, Aug 19, '16. Quoted. 300 words]

Mr. Montagu, the new Minister of Munitions, gave the House on Tuesday [Aug 15, 1916] a remarkable account of the work done for our Army and for the Allies under his department. It now takes a week to make as many shells of all kinds as were made in the first year of the war. Every month we turn out twice as many big guns as the Army possessed last summer, and that output will be doubled. The production of field-guns has been multiplied fivefold and is virtually completed. As for machine guns, in which we were conspicuously inferior to the enemy, we now make in three or four weeks as many as we had in June, 1915. It is very difficult to increase the output of rifles, but we have made thrice as many in the past year as we made the year before. We had three national factories when the war began; now we have 95. One of these fills twice as much shell as Woolwich. The 32 shell factories produce so much light shell that we need no more from America.

Mr. Montagu made the very important statement that the weekly output of heavy shell amply covers the consumption at the front, so that the terrific bombardment on the Somme can be maintained if the factories work at full pressure. This illustrates the direct connection between the task of the field army and that of the men and women at home, to the number of two millions and a quarter, who make the guns and shells. Mr. Montagu paid a well-earned tribute to their industry and devotion and to the good sense of the responsible trade union leaders in smoothing away difficulties. He said, incidentally, that 45,000 skilled workmen had been released from the ranks to "dilute" the masses of unskilled labor in the munition factories.

[Munitions. Editorial. *Army & Navy Gazette*, Aug 19, '16. 1200 words.]

In the House of Commons, Aug 15, Mr. Montagu, Minister of Munitions, gave an encouraging account of the munitions situation. None of the Allies had a useful estimate at the beginning of the war of the amount of munitions required, and the British output was only sufficient for about 200,000 men. Ten months after the war began, a Minister of Munitions was appointed to grapple with the

problem. The Navy absorbed a large part of the manufacturing capacity. New factories and extensions to old ones had to be built. About 45,000 skilled workers had to be recalled from the colors. Labor had to make its sacrifice, and all trade disputes were arranged.

Great Britain is supplying munitions to France, Russia and Italy, and will soon be independent of American sources of supply so much needed in the first months of the war. German output shows no sign of falling off. Our expenditure of late has been huge, but the output amply covers it. The work must go on without faltering.

[Note. *Army & Navy Jour.*, Oct 14, '16. 100 words.]

The Acting Prime Minister of Canada has made a public statement to the effect that it is too late to nationalize the shell shops, as word had been received from the British government that all the shells needed to the end of the war were now made or being made.

#### Spain

[The Fabrication of War Material in Spain. By D. L. Cubillo, Gen. of Div. *Mem. de Artilleria*, (Spain), Feb, '16. 11,000 words. (To be cont.)]

Spain depends to-day entirely upon the works at Trubia for the production of steel for use in the construction of cannon. There is no private establishment that has directed its attention towards this important division of military industry.

In the period 1886-1896, Sotomayer field guns of crucible steel were made at Trubia. In 1891 a Martin-Siemens furnace of an effective capacity of 16 tons, a 1200 ton forging press, and a small tempering furnace were constructed. With this installation 15 cm. cannon, 45 calibers in length, were produced.

During the Cuban war, in 1896, with the desire of freeing Spain from dependence upon foreign sources for war material, the Minister of War and the Artillery Section decided to install at Trubia whatever equipment was necessary for the construction of the coast artillery, fixing as the maximum limit, the caliber of 25 cm.

On this basis were installed a Siemens furnace of 40 tons nominal and 54 tons effective capacity and a Whitworth hydraulic forging press, 35 inches in diameter, corresponding to a total power of 3000 tons. A new tempering plant was erected with two vertical furnaces, one capable of heating tubes 12 meters in length, and the other large enough to admit hoops or tubes up to 6.5 meters, also a quenching tank 15 meters deep. The installation was completed by various other ponderous machines.

Such is, in general terms, the installation for making steel at Trubia, its capacity not having been altered since. At the same time the old plate rolling mill, dating from 1855, was replaced by a more modern type. The construction of the 15 cm. steel cannon and the new model field pieces, both rapid-fire,

necessitated the installation of a plant for making metallic cartridges. A splendid plant of this class was erected at Trubia which, furnished entirely with American machines except the engines and boilers which are English, met the needs of Spain during the formative epoch for this class of material. It is to be noted that the raw material for the manufacture of cartridges, except the discs for the 15 cm. cartridges, is of national production.

The armor piercing projectiles require an extremely careful manufacture. Since 1906 all calibers up to 30.5 cm. have been currently made at Trubia.

The manufacture of steel shrapnel cases has received especial attention during recent years. By working day and night and placing the workmen on a piece-work basis, a daily output of 700 cases was reached during the Melilla campaign. To-day Trubia has a daily capacity of 1000 shrapnel cases for field and mountain guns.

The factory at Trubia is also equipped for the manufacture of large caliber guns and their mounts. The size is limited by the capacity of the tempering furnace to tubes for 24 cm. cannon of 45 calibers length.

The arms factory at Oviedo has a capacity of 30,000 rifles per year, working during the day time only. Its machine equipment was furnished by Pratt and Whitney of Hartford. The metallic raw material, except steel for springs, comes from Trubia.

#### United States

[Munitions of War. *Army & Navy Register*, Dec 18, '15. 400 words.]

Senator Cummins has announced that he will introduce in Congress a resolution calling for the appointment of a committee of five Senators, to look into the question of acquiring or constructing for the government manufacturing plants of sufficient capacity to supply the Army and Navy with all arms, armament, and munitions of war, including ships and their equipment.

The committee will also examine the question of what legislation may be necessary to prevent the manufacture of these articles by either persons or corporations.

[America Arming the Allies. By Sidney Brooks. *Independent*. Mar 6, '16. 2500 words. Illustrated.]

Realizing the need of the Allies for small arms and ammunition, the Remington arms plant at Bridgeport, Connecticut, was expanded by an addition costing \$12,000,000. Work was commenced in 1914, actual construction started in Mar, 1915, and by Nov, 1915, all the buildings were completed and 75 per cent. of the machinery installed. The new plant is not of flimsy construction, but is a permanent addition.

There are thirteen main buildings, each about 60 by 270 feet and five stories high. These are all connected together by twelve service buildings each 50 by 80 feet. The total plant has a floor space of about 1,500,000 square feet. At full capacity, with 36,000 em-

**MUNITIONS—Continued**

ployees the Remington plant will turn out 5000 rifles, 10,000 shell cases, and 4,000,000 cartridges a day. The physical construction of such a plant is no more difficult than the organization of the force to run it. Such a plant is a great asset to the nation as a matter of preparedness.

[To Build Big Factory. Bridgeport Projectile Company gets Order from the Government. *New York Times*, Oct 27, '16. Quoted.]

A contract was awarded, Oct 26, for the erection of a gun factory by the Bridgeport Projectile Company which will be the third largest in the country. The plant, which is to be completed in ninety days, will be 300 feet long, 120 feet wide, and two stories high. It will adjoin their present property.

The company has just received an order for 146 5-inch guns for the Navy Department, and for 600,000 shells of various sizes from the War Department. The work on the shells will begin next week. The contract for the gun factory is to complete the navy work, which must be finished in two years.

**MUSEUMS, Military**  
**—Of Artillery***Spain*

[Some Changes in the Museum of Artillery. M. Dusmet. *Mem. de Artill.* (Spain) April, '15. 5000 words.]

(This article treats of the arrangement of the Museum of Artillery and is of local interest only.)

**MUSIC, MILITARY**

*See also*

**BANDS, MILITARY****MUSKETRY**

*See*

**INFANTRY—FIRE—INSTRUCTION AND TRAINING—MUSKETRY****MUZZLE VELOCITY**

*See*

**BALLISTICS—MUZZLE VELOCITY****NAPOLEON I. (Emperor of the French)**

*See*

**NAPOLEONIC WARS****NAPOLEONIC WARS**

[The Prussian Enemies of Napoleon. By V. Kaiserov. *Voenny Sbornik*, May, '16. 4000 words.]

In April, 1809, Austria declared war against Napoleon. At this time Prussia hesitated as to entering the war. Gneisenau placed his hopes in assistance from England, which country had at that time 40,000 men ready for service, and it was Gneisenau's desire that these troops be sent to Germany.

Without having any official standing, Gneisenau set out for Austria to see what could be done to construct an alliance against France. On his way he received information at Gothenburg of the battle of Wagram, and also that the available British army would not be sent to Germany but to Antwerp. Gneisenau

went now on to London and attempted to have the British army diverted to the north of Germany, but was unsuccessful in his mission. In the meanwhile Austria concluded peace at Vienna. In November, 1809, Gneisenau returned to Germany via Sweden arriving in Berlin in the following June.

He now retired from public appearance, but continued to write to his friends with a view of arriving at some method of overcoming the power of Napoleon. Among his writings were several memoranda for Hardenberg in which Gneisenau set forth his views that Prussia should seize if possible the eight fortresses in that country and draw to them a large force of the enemy, leaving the remainder of the Prussian army available for offensive war; the constant assumption of the initiative, which would raise the morale of the troops with each new undertaking, and which initiative should frequently be used of necessity even when on the defensive.

Up to the spring of 1812, Gneisenau devoted his energies to trying to induce the king of Prussia to deliver the first blow against Napoleon, but without success. Even the people were apathetic and such was the attraction of the genius of the French emperor that many German officers were desirous of uniting their fortunes with those of the French army.

On Mar 9, 1812 an alliance was signed between Prussia and France, and as a consequence many German patriots were forced to leave Prussia, and in general joined the Russian forces. Gneisenau went first to Silesia, thence to Vienna and finally to Vilna, where he drew up a memorial for the Tzar advising an offensive war against Napoleon. From here Gneisenau traveled via Sweden to England, and finally returning to Prussia after he had learnt of the result of the Russian campaign, arrived at Colberg on Mar 10, 1813.

(To be continued.)

*See also*

**JENA, BATTLE OF**  
**PONIATOWSKI, MARSHAL**

—1815

*See also*

**WATERLOO, BATTLE OF****NATIONAL GUARD (U. S.)**

[The Proposed Continental Army and the National Guard, by Maj. Gen. J. F. O'Ryan, N. G., N. Y. *The National Guard Magazine*, Dec, 1915. 8000 words.]

The National Guard is a force that is representative of the people and would be of inestimable value to the Federal Government both in war and peace if certain legal restrictions could be overcome.

Believing, however, that it is impracticable suitably to organize the Militia under the militia provisions of the Federal Constitution the War Department plans to take advantage of the privilege given Congress by the Constitution to raise and support armies, and thus to organize and maintain the Continental Army. In general, the reasons given



for supporting the War Department plans are that the training and maintenance of the Continental Army will be limited to a period of field training during the summer months, the student camps having shown that much valuable military training can be given newly organized troops in short periods of intensive training. The duration of the periods can be determined only by experiment. They will depend largely on the civil obligations of the personnel and the demands of efficiency. (The public press is in error in reporting this period as two months. That period was selected only as a unit of time to be used in computing the cost.)

The War Department contemplates the transfer of the Organized Militia to this new force, and has requested the Militia to recommend certain provisions which would make the transfer practicable. For such a transfer to become effective, action must be taken first by the States themselves rather than by the Federal Government. Whether or not the transfer would be generally recommended throughout the Guard depends on whether or not certain National Guard organizations, many of which possess historical traditions, will be preserved intact, whether or not the state appropriations would be continued, etc., etc. However the War Department does not attempt to answer any of these questions, but simply indicates its willingness to have the Guard enter the Continental Army, leaving to it the matter of preparing the recommendations necessary to make the transfer effective.

On behalf of the plan it is claimed that the Continental Army is soundly organized, is economical, that sufficient voluntary enlistments will be obtained, that its scheme of training will produce reasonable efficiency, that the expense is justified and that the transfer thereto of the National Guard can be suitably arranged.

Some of the objections to the Continental Army scheme are that its organization, theoretically sound, will not prove practical; that the results of a few training camps are not sufficient to justify the conclusions drawn therefrom; that the class claimed as available for the Continental Army contains many who have no employment, and these men are not suitable for military service; that the annual change of personnel would be too great and that its *Intensive Training* will not prove satisfactory.

It is claimed by many that the National Guard would not transfer to the Continental Army and many detailed reasons are given in support of this claim.

It is impossible to say which of the above views is correct, but in any case the National Guard should be an important part of the first line. The remedy for the legal defects previously mentioned is an amendment to the Constitution. It must be such an amendment as would give the Federal Government control of the National Guard for any purpose for which war may be conducted, but still leaving to the several states the authority to use that portion of the militia within its

borders for the suppression of public disorders, etc.

See also

AERONAUTICS—PERSONNEL—UNITED

STATES

UNITED STATES—COMPULSORY MILITARY SERVICE

UNITED STATES—ARMY—LEGAL POWERS OF

UNITED STATES—ARMY—RESERVE

UNITED STATES—MILITARY POLICY OF—

"CONTINENTAL ARMY"

UNITED STATES—MILITIA

Hawaii

[Note. *Army & Navy Jour.*, Dec 4, '15. 100 words.]

In six weeks the National Guard of Hawaii increased from 700 to 3693 men, exclusive of naval militia. The same proportion would give continental United States 3,000,000 men.

—Federal Control of

[What Is the Answer? By Charles C. Foster, Late Surgeon-General of Massachusetts. *Arms and the Man*, Dec 30, '15. 800 words.]

In the present search for a suitable plan of providing an adequate force for national defense, many people seem inclined to disregard the National Guard, and there are those who even believe it should be dropped altogether.

This is a mistake. The country must face the present military situation. It must provide an efficient army, and, since popular distrust prevents our having a standing army large enough to properly defend the nation, our only hope lies in a force of citizen soldiers—a force in which every citizen is concerned, in which the membership is constantly changing, and of which every man spends 95 per cent or more of his life as a citizen.

Our only present force of this type is the National Guard, and, though at present defective in many ways, it is worth saving and can be made more valuable than most short-service armies would be in this country. The passage of the pay bill, for instance, would help recruiting very greatly and would reduce the constant loss of good officers. Such help from the government is needed, and since it is not willing to spend money on a force which it does not control, constitutional amendments should be enacted, giving the federal government a thorough control over the Guard. Under such control the Guard would be truly a national one and we would have some guarantee of permanent efficiency.

Of the other plans proposed, most provide for too short a service. It is true that the Swiss achieve efficiency in a few months of hard training, but their recruits come to them well grounded in the routine duties of a soldier, in which they have been thoroughly trained in the public schools.

Some plan for providing an adequate force for defense must be adopted. We are in a most critical situation. We cannot hire enough men to do our fighting for us. We must do it ourselves; and this means some form of national service, which, wisely organized and fairly distributed, will cost a comparatively small sum for insurance, and will

**NATIONAL GUARD (U.S.)—Continued**  
furnish our only guarantee of continued national life and liberty.

[Federal Control of the National Guard. *Army & Navy Jour.*, Jan 22, '16, 1000 words.]

(Reprint of a letter from Capt. Richard Stockton, N. G. N. J. to Senator Chamberlain and Representative Hay.)

The majority of the National Guard wants to be a Federal rather than a state controlled force. High ranking officers opposing federal control do not represent the true sentiment of the National Guard. Nor does the National Guard Association in its convention represent the National Guard as a whole. It is the high ranking officers and the Adjutants General who try to make it appear that the Guard opposes federal control, but actually it is because these officers fear to lose some of their power or rank.

Any force intended for national defense should be under federal control. There is practically no need for the states to maintain forces if federal forces could be used in case of necessity due to internal disturbance. It is probable that as between a state force maintained wholly by the state and a federal militia maintained entirely by the federal government, most of the states would choose to transfer the National Guard to federal control.

If we want to give the states money for police purposes, all well and good, but we should not be deluded into believing that we are thus preparing for national defense.

The following is suggested as a combination of the good features of the Militia and the Continental Army system:

a. A federal citizen soldiery raised under the clause "to raise and support armies."

b. Provision for enlisting or commissioning all officers and men of regiments or smaller units of the National Guard, and all general and staff officers of the Guard which the U. S. might desire, subject to the discharge of such officers and men from state duty.

c. Provision for renting and maintaining all state armories, ranges or other buildings or ground that might be desired and be offered by the states, or when none were offered of other suitable property.

d. Provision for the pay of officers and men of this force at the rates for winter drills suggested by the N. G. Association for the militia.

e. Provision whereby the Governors may requisition the troops of this force stationed within their states for local emergency except in time of war or when war is imminent, the states to pay the cost of such use.

f. Provision for pay and rank for the citizen soldiers as suggested in the bills now proposed to cover pay and rank of such troops in the field.

g. Provision whereby officers of the Federal citizen soldiery could be detailed for duty with the Regular Army or elsewhere at full pay, with their own consent and when considered desirable.

h. Provision for a reserve for the citizen soldiery.

i. Repeal all appropriations for troops under state control.

k. Providing for a reasonable period of summer training.

Such a plan would not only be constitutional, but it would make it to the advantage of the states to support it, would be heartily supported by the line officers and men of the National Guard, and would provide the best force of citizen soldiers possible without universal service. Furthermore, universal service could easily be an added feature, either at once or when new lessons drive home the necessity.

[The New National Guard Bill, *The National Guard Magazine*. Feb, '16, 400 words.]

In the proposed legislation looking to the federalization of the Militia the first noticeable feature is a change in the military age. This will be from 12 to 64 years instead of from 18 to 45. The Militia will be divided into three classes: The National Guard, 18 to 64 years; the Junior Guard, 12 to 18 years; and the unorganized militia. The Junior Guard, which can not be called into service until after all the other classes, will be still further divided into cadets of the first class, not younger than 15 years, who are students or graduates of high schools or higher institutions of learning, and cadets of the second class, comprising all other members of the Junior Guard. The scheme for the organization, training and discipline of the entire guard will be similar to that of the army.

In the future, enlistments will be for three years and enlisted men will be subjected to the same qualifications as in the army. No man now serving under a contract to defend the Constitution of the United States and to obey the orders of the President will have to re-enlist under the new act, but hereafter the enlistment contract will contain the following:

"In the event that the President of the United States shall order the National Guard into active service because of war or imminence thereof within 3 years from the date of my enlistment I agree to serve . . . the United States within or without the continental limits of the United States for a period of 2 years from the date of said order or until discharge by order of the President."

Commissioned officers in the National Guard will continue as such. In the future they must be from: (1) officers or enlisted men of the Guard; (2) officers on the reserve or unassigned list of the Guard; (3) officers, active or retired, or ex-officers, of the Army, Navy and Marine Corps; (4) graduates of Military or Naval Academy or of certain other schools named by the War Department.

The National Militia Board is to be abolished and in its place an additional section of the General Staff, appointed by the President, composed of 5 officers of the National Guard to serve for 5 years and to receive the pay and allowances of their grade. This

section to be subject to the orders of the Secretary of War and the Chief of Staff.

Yearly pay is provided for National Guard officers as follows:

Major generals.....	\$800.00
Brigadier generals.....	700.00
Colonels .....	600.00
Lieut.-colonels .....	550.00
Majors .....	525.00
Captains .....	500.00
First lieutenants.....	300.00
Second lieuts. and veterinarians....	250.00

There are provisions for pensions, rifle ranges, and for sending Guard officers to military and service schools. Congressional action is not necessary to allow the President to call out the National Guard when the United States is invaded or in danger of invasion or in case of rebellion against the authority of the government.

[The Organized Militia and the Law. *Army & Navy Jour.*, May 13, '16. 1600 words.]

In a statement before the House Military Committee, Brig.-Gen. E. H. Crowder, Judge-Advocate General answered the question, "Would it be possible to frame a law that would allow the President of the United States to draft the Organized Militia into the Volunteer Army; and would it be practicable to resort to the draft to bring all the Organized Militia organizations into the Volunteer Army" in time of war? to the effect that although such a law might be "judicially questioned," it was in his opinion practicable.

Complete federalization of the militia is impossible, because the Constitution reserves to the States the right to officer the Militia, and to train and govern it when not under call by the Federal government. There are two views as to the power of the Federal government to legislate in respect to the militia. One is that the government has already gone to or beyond the limit of its powers, and another that it may still go much further.

Adopting the latter view as that most favorable to Federal control, Congress might further prescribe:

- (a) The recruiting service of the Organized Militia;
- (b) The qualifications of officers;
- (c) The total strength and proportionate strength of the different arms;
- (d) The exempt classes.

But the Federal government has no power to enforce what it has prescribed in these respects. The opinion was also expressed that it would be impossible to frame a law to provide for a dual contract with the state for service in the Militia and with the Federal government for service in the Volunteers. The draft would cure this difficulty. Any militia-man who refuses to obey the call of the President to the service of the United States can escape by undergoing adjudged punishment.

See also

UNITED STATES—ARMY—RESERVE

—Instruction and Training

[Realism in the Militia Armory. By John

S. Barrows. *Arms and the Man*, June 1, '16. 1200 words.]

If the organized militia is turned over to the control of the United States, it may be that some desirable improvements will be made in the armories, which, intended to be used as homes for military organizations and to provide them opportunities for improving themselves in the military art, are at present ill-adapted to this purpose.

Armories should be designed so as to further in every way possible the instruction and development of the men quartered therein. Some simple problems in formation and movement may be given with very simple "properties" and "scenery," but better results will be obtained when the armories are more fully equipped with scenery which is more than imaginary. If the armories were planned to include walls unbroken by rows of useless windows, a field would be provided for what is a necessity in every armory—a landscape painted on the wall, to afford points for simulated firing. The service of windows could be confined to overhead lights, which better light a floor for day work as well as at night.

The landscapes should be painted with proper regard to values of light and shade, and with careful attention to certain details, sufficient to permit the use of field-glasses in selecting points for objectives. The scene should be painted with careful attention to perspective and should represent a typical landscape, including rolling fields, roads, paths, forests, and fences and stone walls in the vicinity of farmhouses representing vantage points for outposts.

Such a landscape would afford objectives for simulated firing, and objects for division of sectors and points for concentration of fire. Experiments in estimating distances could be attempted, and if the landscape could be a picture of an actual locality, actual distances could be known for reference and proof of tests.

The uninspiring commands "At that window," or "At that wall," would no longer be used and fire could be concentrated on different objects with more success.

For Coast Artillery armories, a sea view with vessels should be represented. If the equipment for sub-caliber practice is provided, the backing should be made to resist the shot.

In the present armories where it is not possible to paint such landscapes on the walls, use may be made of large screens for this purpose, and these may be so multiplied and the scenes so diversified as practically to surround the drill room with landscape according to the requirements of the drill or problem. Such an aid would result in securing better attention and interest, and therefore better results in the drill and training.

[The Right Idea. *Arms and the Man*, Dec 2, 1915. 450 words.]

In a Cleveland newspaper of the week of Nov 21, there appeared an application blank

**NATIONAL GUARD (U. S.)—Continued**  
for enrollment in the Ohio National Guard Military Training School.

This is a school where any able bodied citizen over 18 years of age may take a course in military training. Those enrolling will be under no expense and will assume no obligation to any organization.

Already 50 young men have applied for enrollment and have promised to attend each of the twenty-five lectures and drills in the course.

The school will be under the direction of the Ohio National Guard.

[The Training School, Massachusetts Volunteer Militia. By Capt. Ralph McCoy, Infantry. *Infantry Journal*, Mar, '16. 3450 words.]

After several years of effort, a training school was established in 1913 for the volunteer militia. The school aims at preparing enlisted men for the duties of volunteer commissioned officers. The course is for two years, and is as follows: A three days' camp in September; two-day sessions held once a month from October to May, inclusive; and an eight-day camp to terminate the year's work.

Competition is keen to attend the school for the 800 hours per year that are required, and the extension of the system to other states will be beneficial. A general board consisting of the Adjutant General, the Inspector-Instructors, and the Commandant supervises the course, consisting of formal drill, guard duty, calisthenics, voice culture, sword manual, visual signalling, tactical problems, supply service, lectures on military discipline, etc. The students are designated as Junior and Senior Cadets. Each company of infantry, coast artillery, signal corps, marine guard, and each troop of cavalry sends one cadet annually; each battery of artillery two annually; each squadron of cavalry, each separate battalion of infantry, and each battalion of artillery sends one at large annually; each regiment four at large, and each ambulance corps and hospital company one. If no vacancies occurred, this would mean 127 members in each class. Schedules and interior regulations are based upon those of the army military schools. The annual encampment is held when possible near regular troops—in 1914 at Plattsburg with great benefit to all. In 1915, authority was obtained to allow the encampment to be held at West Point, where valuable experience was gained.

Officers of Militia are appointed in Massachusetts as elsewhere, and no graduate of the Training School has any vested right to a commission. Their training secures recognition, however, and will receive more in the future. The graduates will be useful in officering volunteer troops, if needed. One of the best features of the Organized Militia is recognized to be its ability to furnish partially trained officers to the volunteers, and this school goes a long way toward correcting the lack of officer material by training these

cadets in the rudiments of the military profession.

[Field Firing of the Organized Militia. By Capt. W. N. Hughes, Jr. Infantry, Inspector-Instructor, Org. Mil., Tennessee. *Infantry Journal*, Mar, '16. 5000 words.]

Field firing was undertaken by the militia of Tennessee for the betterment of its instruction. Indoor competitions during the winter months were held by about one-half the companies. Gallery practice, however, was not completed in all cases, one company firing until two in the morning on the day it entrained for camp. Results proved that the preliminary training was not thorough, due to lack of time principally, also of qualified instructors.

Ninety per cent. of the men were found to be in need of the most elementary instruction in the use of the piece, and to standardize instruction, a lecture was given to the n. c. o.'s, who then instructed their companies.

The Organized Militia course, instruction and record, was then fired by the 1024 men present, this total being 70 per cent. of the state forces. Results of firing were as follows: 42 expert riflemen, 53 sharpshooters, 75 marksmen, 96 first-class men, 20 second-class men, 728 unqualified.

Field firing was by squad, by platoon, by company, and by battalion. Every man took part, there being 87 squads, 40 platoons, 20 companies (1st phase—16 companies 2d phase), and 3 battalions in the respective problems.

In the squad problem, 64 per cent. were less than good in rating. Poor leadership caused by stage fright, lack of preliminary training, and lack of experience, were responsible for the poor showing. One-third of the squad leaders shut their eyes, said fire and nothing more. The rate of fire in some squads was terrific. The more excited the men become the more completely is accuracy eliminated.

The platoon problem showed some improvement in accuracy, distribution and control of fire. The corporals had commenced to learn their lesson of leadership. The average per platoon was 11 per cent. of hits, distributed on 67 per cent. of the total number of targets. In two platoons firing ceased while ammunition was being distributed. The company problem, in two phases, developed better and slower rate of fire. There was an increase in accuracy and an actual improvement in control.

The battalion problem showed marked increase in control. There was still difficulty in executing "Cease Firing" promptly.

The results of the firing are not reduced to the standard of firing as prepared by the School of Musketry, as the average reader will understand the above better.

Owing to inexperience of the men firing, and the consequent possible danger, problems similar to the Casey problem were omitted. Seventy per cent. of the men had never fired rapid fire, not having qualified at slow fire.

as required and it is believed that the course for Organized Militia would be improved by requiring five shots slow and rapid fire at each range instead of the present requirements.

Too much ammunition and time are given to the man who shows aptitude in shooting, and not enough time to the poor shots. These problems were instructive and highly profitable, all things considered, and they illustrated the necessity of thorough training and leadership as never before. The experience was well worth while to the Militia of Tennessee, and shows also how important the time element is in militia training.

—Mobilization of

[Mobilizing the Guard. *Arms and the Man*, June 29, '16. 700 words.]

There are three chief causes for the apparent delay in mobilizing the National Guard for service on the Mexican border. These are, first, the requirement that before federal muster each National Guard unit be recruited to war strength; second, lack of reserve supplies at Q. M. depots to equip all the forces called; and, third, the maintenance of high and rigid standards of physical qualifications for enlistment.

Congress is directly responsible for the lack of material with which to equip the organizations, and the requirements as to full strength units and strict physical examinations were very wise. Thus much of the delay was due to circumstances over which the Guard had no control. In spite of these handicaps, however, some of the units called out on the night of June 18 had been mustered into the federal service before nightfall of June 24, while others passed into the federal service before July 1. This is a much better record than that made either in the Civil War or in the war with Spain.

[The Mobilization of the Militia. Editorial. *Scientific American*, July 22, '16. 700 words.]

The mobilization of the National Guard was valuable in the information it gave. There were delays. In some cases the state camps were not ready, and there was lack of equipment. Rigid physical examinations and discharges removed 20 per cent. of the strength. Practically all the necessary animals had to be purchased.

"So this is the result. Three weeks' effort. No consideration given expense. Every available guardsman called. And in three weeks' time 50,000 men at the border partially equipped, and not in units to form an army for tactical use, with some 50,000 more scattered over the country from coast to coast. . . . We may as well frankly face the truth. The system is a failure."

—Reorganization of

[Note. *Army & Navy Jour.*, Nov 27, '15. Quoted from the *Chicago Tribune*. 300 words.]

The following data are given concerning the twelve National Guard divisions (numbered five to sixteen inclusive) so far organized:—

"The twelve divisions are complete in infantry, with the exception of the sixteenth, which lacks two regiments. Only one of the twelve has a complete cavalry regiment. The sixth is the only one with two regiments of field artillery, and also the only one with a battalion of engineers. Five divisions have their proper allowance of signal troops. All lack ammunition, supply and pack trains. To complete the twelve divisions it would be necessary to organize two regiments of infantry, sixty-six troops of cavalry, seventy-seven batteries of field artillery, twenty-six companies of engineers, eleven field signal companies, thirty-six ambulance companies, twenty-six field hospitals, twelve ammunition trains, twelve supply trains, and twelve pack trains. These twelve divisions will probably be organized in four field armies, possibly more. Each of these field armies would be commanded by a lieutenant general and should have, in addition to the three infantry divisions, a cavalry division of six or nine regiments; a brigade of infantry, three battalions of heavy artillery, one pontoon battalion, one aero-wireless battalion, one ammunition train, one supply train, one ambulance company and the necessary line of communication troops. All these field army troops are lacking with the exception of four signal corps companies. Each of the cavalry divisions should consist of two or three brigades of three regiments each—that is, six or nine regiments—one regiment of horse artillery, one pioneer battalion of engineers, one field battalion of signal corps troops, two ambulance companies, two field hospitals, one ammunition train, one supply train, two or more pack trains, and one light bridge train."

—Sanitary Service

See also

SANITARY SERVICE—INSTRUCTION AND TRAINING—MILITIA

—Strength of

[Resignations of National Guard Officers. *New York Times*, Oct 29, '16. Quoted.]

President Wilson has accepted since July 20 the resignations of about 500 officers of those units of the National Guard which were ordered to the Mexican border. The resignations, it is stated on competent authority, have averaged about eight a day for more than three months past, and the end is, as an army officer put it, apparently 'nowhere in sight.'

Furthermore, it has been found practically impossible to recruit the National Guard units to war strength, and at present, it is said, the Guard units on the Rio Grande average about 40 per cent. of the required total needed to bring them to war strength.

The resignation of so many officers has caused a great deal of comment in military circles, particularly among those who have favored an absolute federalization of the militia. At the last session of Congress it was the National Guard lobby that frustrated all efforts to create a continental federal force, or other body of soldiers along similar lines, and one of the arguments used by the Guard advocates was: "Give the Guard a chance,

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and when the time comes it will make good."

"Has it made good?" an army officer asked, yesterday.

He then pointed to the shortage of men in the enlisted personnel and to the hundreds of officers who had resigned since the troops were mustered into the federal service. The resignations referred to were only those which President Wilson had accepted to date, not by any means the total number of officers who have sent in their resignations. In numerous cases the War Department and the President have not yet acted. Of all the States, just two are missing from the list of accepted resignations. Those two are Oregon and Washington. New York, Alabama, Pennsylvania, Illinois, and California lead in the number of officers whose resignations have been accepted by President Wilson.

[A list follows of resignations by names, states, and dates.]

**NAVAL ARTILLERY**

[Howitzers on Board Ships? By an Artilleryman. *Artill. Monatshefte*, July-Aug., '15. 4000 words. Illus.]

Report has it that from a position in the Aegean, the British battle ship *Queen Elizabeth*, succeeded in destroying the pontoon bridge across the Dardanelles at Nagara. To accomplish this, 15-in guns at a range of 14,000 m. were no doubt used. The feat is not impossible under favorable conditions of weather and observation. The English very probably used a lighter projectile with reduced charges, in order to attain greater angles of fall. The event has raised the question why howitzers cannot be used aboard ship as part of the naval artillery.

The reason lies in the technical difficulties involved in firing from a gun platform which is changing constantly, not only in position and elevation, but also in its inclination to the horizontal, as is the case on board ship. The initial velocity of the projectile would vary according to the speed of the ship, and the direction of its course with respect to the line of fire. Since the time of flight for howitzer projectiles is very great, this would have a great influence upon the range. The amount of deflection to allow for various displacements becomes also great. It not only depends upon the movement of the ship, but also upon the angle of elevation of the howitzer. In addition, the displacement due to the roll and pitch of the ship must also be considered. The naval gun pointer must usually wait until the ship reaches the horizontal position. It is customary to allow 0.2 seconds from the resolve to fire to the moment the projectile leaves the bore.

The conditions which arise can be seen graphically by plotting the path of the center of impact, and comparing this work with the plan of a vessel of the "King George" type and the probable zone for the 21 cm. and the 28 cm. howitzers, at ranges of 7700 and 10,000 m. respectively at a speed of 15.5 and 19.5 nautical miles respectively. This gives a fairly clear idea of the great difficulties en-

countered in firing of howitzers from a moving vessel at another moving vessel. The chances of hitting are very slight.

The conditions of range finding are more difficult than with coast fortifications. The ammunition supply for war ships is also limited. In general, the conditions have not become more favorable for the howitzer, because the new heavy caliber naval guns can easily perforate the heaviest armor at the principal battle ranges.

The conclusion drawn is that the use of howitzers on board ship would be a mistake, and that this will hold for the future also. It is, however, advisable to use lighter projectiles with reduced charges on all heavy caliber naval guns when it is desired to get greater angles of fall in the attack of coast fortifications by naval vessels.

**NAVAL OPERATIONS**

See also

AERONAUTICS—LAUNCHING NAVAL TORPEDOES FROM AIRCRAFT

AERONAUTICS—NAVAL USE OF BLOCKADE

COAST ARTILLERY

COAST DEFENSE

LANDING OPERATIONS

SHIPS AND SHIPPING (MERCHANT)

**—Aeronautics in**

[The War in the Air. By L. d'Orcy. *Flying*, July, '16. 2880 words. One illustration.]

In the battle of Jutland, the German admiral won a strategic victory when his air scouts readily located Admiral Beatty's force, for this enabled the Germans to attack nine British battle cruisers with 16 dreadnoughts and five battle cruisers. The tables were turned upon the arrival of the entire British fleet. Here, again, the Germans prevented a disastrous defeat by using very cleverly the Zeppelins and utilizing the low visibility.

Two Zeppelins were destroyed in the action, but the work done by them was so valuable that the English are now building six, three of which are nearly completed.

**—Attack**

[The Failure to Capture Cattaro and the Dardanelles, and the Necessity that Italy Shall Possess a Part of the Eastern Coast of the Adriatic. By Giuseppe Natale, Col. of Engrs. *Riv. Mil. Italiana*, July, '16. 5000 words. Illustrated.]

The lack of success in the naval operations on the coasts of the Adriatic and the Aegean has resulted from the fact that ships of war are constructed and armed primarily to fight other ships and not to reduce permanent sea-coast defenses; their proper functions in the former operations are those of convoy, bombardment, disembarkation, blockade, and the like. All military technical literature shows that ships cannot contend successfully with high shore batteries.

Ships are not armed to execute high angle fire. Their armament is of three kinds:—large caliber for use against heavy armor; medium caliber for use against light armor and superstructure; and small caliber for use

against minor craft. The life of the large guns is very limited. Their range is from 15 to 25 km., but they cannot be considered effective beyond 20 km. No mortars or howitzers are carried. To bring curved fire to bear on coast forts it is necessary for ships either to fire from a long distance with their greatest permissible angles of elevation or to come in close to the shore, drop anchor, and give the vessels a list sufficient to secure the required elevation of the guns. In the first case the fire will be inaccurate and in the second the ships will be exposed to the danger of very effective short range fire from the forts and also of going aground.

The best way to resist an operation of disembarkation and bombardment is with a fleet acting offensively against the hostile fleet. If this is not possible recourse must be had to mobile forces sent to the threatened point.

The present discussion, however, is concerned with the permanent seacoast defenses of a country, which are usually concentrated at a number of the most important centers. The defenses consist of a group of batteries armed with howitzers and mortars placed 100 meters or more above sea level. The caliber used is generally 280 mm. and the maximum effective range is 8 to 12 km. If the batteries have to be placed at a low elevation guns are used instead of mortars.

At both Cattaro and the Dardanelles there are heights of more than 100 meters occupied by numerous batteries of howitzers. The ships lost by the Allies show the advantage that such batteries have over ships. If it be asked why the Allies undertook such a risky operation, the reply is that in war it is sometimes necessary to consider political as well as military reasons.

For the shelter, repair and supply of ships, nations maintain naval bases which are usually situated on bays or straits having anchorage room for a large fleet. An establishment of this kind contains drydocks, workshops, and stores of coal, provisions and ammunition, all of which must be protected by strong fortifications, placed at such a distance that hostile vessels cannot approach within bombarding range of the base. This requires that ships shall be kept at least 18 to 20 km. from the vulnerable points.

The Adriatic coast of Italy, from Venice to the Cape of Leuca, has few bays and few islands close to shore. Venice is not sufficiently withdrawn from the coastline to be beyond the range of modern naval guns. This state of affairs is a grave menace, not only to the commercial freedom of the Adriatic, but also to the political existence of Italy. This is why Italy deems it necessary to extend her control and influence over the shores of the Adriatic now controlled by Austria.

To-day the war is popular because the people see in it the redemption of their brothers, but it is necessary that the Italian people understand that the war has a much greater purpose—not only the political and economic future of the two sister provinces, but also

that of all Italy. For this reason the voice of Italy must be heard in the peace congress of tomorrow, in order that the Adriatic question shall cease to be one of her bitter memories.

#### —Attack—Coast Defense Against

See also

COAST DEFENSE—AGAINST NAVAL ATTACK  
DARDANELLES—OPERATIONS AT THE (1915)

#### NAVY

[The Sea-Soldier of Antiquity and the Middle Ages. *Journal of the Royal United Service Institution*. Aug, '16. Tables. 5000 words.]

(Historical.)

See also

TACTICS—JOINT OPERATIONS—ARMY AND NAVY

#### —Ships and Matériel

See also

MOTOR BOATS

#### NETHERLANDS, THE

See

HOLLAND

#### NEUTRALITY

[Some Views Regarding the Subject of Neutrality. By Dr. L. M. G. Kooperberg of the Hague. *De Militaire Spectator* No. 9, Sept, '15. 4000 words.]

Strict neutrality implies taking no active part in the conflict and treating the belligerents with perfect impartiality. It means standing altogether aloof and doing nothing which could be considered as favoring one belligerent more than the other. Theoretically, the fundamental principles on which the idea of neutrality is based are few and easily understood, but in practice the rights, duties, and obligations of neutrals, have given rise to many serious and complicated questions. It is generally admitted that a neutral state violates the principle of neutrality by furnishing any belligerent any of the articles which come under the denomination of contraband of war, but this implies that all articles which are contraband of war must be definitely and clearly specified. So also the right of search; effective blockades; the right of carrying the enemy's goods, not contraband, in neutral bottoms; the new problems involved in aerial navigation; these with all their numberless details lead to endless questions and disputes. Even treaties and declarations are variously interpreted and often fail to cover the points at issue, with the result that every war furnishes new complications, and occasions new serious troubles, which but too often constitute the beginnings and causes of future conflicts.

(A résumé of the history and development of the neutrality idea is given in this article for which reference must be made to the full text.)

See also

EUROPEAN WAR—RELATIONS WITH NEUTRALS  
PROPERTY RIGHTS (IN WAR)

**NEUTRALITY—Continued****—Lessons of the European War***See also*

EUROPEAN WAR—NEUTRALITY ASPECTS OF

**NEUTRALIZATION***See also*

RIVERS—NEUTRALIZATION OF

**NEUVE CHAPELLE, Battle at****—Artillery, Use of in**

[Foreign Notes. England. Artillery in the Combat of Neuve Chapelle. *Mem. de Artill.* (Spain), May, '15. 1000 words.]

(Credited to an account in the *London Times* of the period beginning March 11, 1915. Lays stress on the power and accuracy of modern field guns, enormous consumption of ammunition, and difficulty of maintaining communication with the infantry.)

**NEY, Marshal**

["Bravest of the Brave," a Centenary. By Percy Cross Standing. *United Service Mag.*, Dec, '15. 1800 words.]

Marshal Ney's career is briefly sketched. He gained his commission in 1792, and became A. D. C. to Gen. Lamarche. Associated successively with Kléber, Hoche, he was finally, in 1797, put in command of all the mounted troops in Masséna's army, with the rank of General of Division. Assigned to the Army of the Rhine under Müller in 1799, Ney succeeded to the command of that army. From then until 1815 he was associated with the Grand Army. The curtain fell for him with Napoleon at Waterloo.

**NIEUPORT AEROPLANE**

[The Nieuport Scout. *Aerial Age*, Sept 4, '16. 1040 words. 2 illustrations.]

The machine is a biplane, designed and built for speed and is now the standard speed scout in use in the French army. It has a span of 24 feet, length of 18 feet. The chord of the bottom plane is two feet and four inches, and the top plane three feet and 11 inches and has an area of 145 square feet.

The motor is a 80 h.p. Rhone and consumes .57 pounds of fuel and .094 pounds of oil per h.p. hour.

**NIGHT ATTACKS***See also*

ILLUMINATION—FOR NIGHT ATTACKS

**NIGHT OPERATIONS***See also*

INFANTRY—NIGHT OPERATIONS

**NISH-CONSTANTINOPLE RAILROAD**

[The Nish-Constantinople Railway. By Crawford Price. *Sphere*, Nov 27, '15. 700 words. Map.]

Due to the importance of Constantinople, the railway is well constructed and the luxurious Orient Express and other less elaborate through trains are run. From Nish, the railway follows the valley of the Nishava River to Pirot, through beautiful and impressive mountains. At Pirot the railroad leaves the Nishava valley temporarily, rejoining it at

the Bulgarian frontier. The customs station is Tzaribrod, where the road enters a fertile lowland country, running thence in a southeasterly direction through an uninteresting plain to Sofia, a well constructed city with broad, well-paved streets. Branch railroads run north and southwest from Sofia. Running southeast from Sofia, the railroad enters the upper valley of the Maritza River, which it follows via Philippopolis to Lule Burgas, whence there is a branch running to Dedea-gatch. The main line runs thence east over the magnificent rolling plains of Thrace, via the low, sandy hills at Chataldja to Constantinople.

**NOBLE, Sir Andrew**

[The Late Sir Andrew Noble. *Arms & Explosives*. Nov '15. 350 words.]

No man has contributed more to the development of modern guns and explosives than the late Sir Andrew Noble, the veteran of artillery science. A born experimentalist, his forte was the compilation of intricate data giving a clue to the action of hidden forces. His determination of closed chamber pressures and his development of pressure curves from time measurements along the bore rank as his greatest accomplishments.

Sir Andrew was the executive head of the great Armstrong business.

**NON-COMBATANTS**

[The Lot of the Innocent Bystander in War. By Thomas W. Jackson, M.D., late capt. and asst. surg., U. S. V., late member American Red Cross Commission to Serbia. *Military Surgeon*, Apr, '16. 5000 words. Illustrated]

Among the hardships imposed on the civilian population by war may be mentioned the following:

1. Food shortage, resulting either from absolute lack of supplies or failure in distribution, amounting in extreme cases to starvation.
2. Overcrowding or exposure due to migration from the theater of operations.
3. Prevalence of contagious diseases due to overcrowding.
4. In Serbia, normally unsanitary conditions emphasized by effects of war.
5. Few or no doctors to attend the civil population.
6. Shortage of medicines and drugs.

The American Red Cross Commission did what it could for the Serbians, and succeeded in relieving some of the distress.

**NON-COMMISSIONED OFFICERS****—Selection of**

[Means of Securing a Good Corps of Non-Commissioned Officers. By Col. J. E. Rodriguez. *Rev. del Circulo Militar*, May, '16. 2000 words.]

Many qualities are required in a non-commissioned officer of troops in order that he may perform properly the diverse and important services required.

He should possess good legs and good lungs; the prominence of his chest and the erectness of his figure should clearly show his vigor.



He should be permeated with a sense of duty and should be sober and obedient.

It is not necessary that his intellectual attainments be surpassing. It is sufficient that he have sound sense and a good memory, and that he be able to read, write and perform the elementary operations of arithmetic.

As for his military instruction, he should have a perfect theoretical and practical knowledge of the regulations in letter and spirit, in so far as the duties of his subordinates and of himself are concerned. Higher military knowledge is desirable, but not indispensable, as for instance, map reading, sketching, elementary tactics, etc.

Being the instructor with whom the soldier is in continual contact, he should possess marked traits of character. He should be patient and tranquilly energetic, exact and punctual in service.

From what has been said, it is clear that the aptitudes which a non-commissioned officer should possess are based on practice and length of service. The important question is how to secure permanency of service for non-commissioned officers.

It is difficult to get non-commissioned officers to enlist in any event, from the simple reason that they dislike the laborious work of instructing annual contingents. At present the difficulty is increased, due to the greater number required for the larger army. Besides, the pay and standards of living which public service, the arts, industry and commerce offer to industrious youth of good conduct militate decidedly against the permanency of enlisted men in the army. This problem leads us to endeavor to find a means whereby non-commissioned officers may be offered a desirable career with advantages in proportion to those offered by civil life.

Owing to the life of intense activity and labor of a non-commissioned officer, it is thought desirable to retain him in service not more than 15 years as a general rule.

*Non-commissioned officers' schools.* These may be conducted either with the troops or in special institutions. The former method seems much the better:

1. Company commanders have greater flexibility in the selection of candidates.

2. The non-commissioned officer comes into daily contact with the element over which he is to exercise authority, and is thus in a better position to know and appreciate the condition of his soldiers.

3. It is insured that the education and instruction of the future non-commissioned officer will take an eminently practical and applicatory direction. He will acquire by absorption the body of traditions, customs and sentiments which constitute the characteristics of the military state in general, and the special features which pertain to his branch in particular.

The preparation of non-commissioned officers in special institutions has the following disadvantages:

1. The selection of the aspirants will be less free, since it will have to be made by the

elimination of the less apt from those who have secured authority to enter the school.

2. Special institutions, it is true, may give a relatively short and intense period of instruction, highly finished and more uniform from the point of view of method and order, but, however much it may be desired to give to them a strictly military stamp, nothing can completely eliminate the scholastic character.

3. In such an institution one cannot learn and exercise the practice of service and of discipline.

As a consequence, the graduate on entering the army encounters an atmosphere so different that a new orientation is necessary in order that he may shape his conduct to meet his new surroundings.

*Permanency of the non-commissioned officers in the service.* In order to obtain the best type of non-commissioned officers, it is necessary to make his position an interesting and attractive one in itself, with the prospect of future advantages even after leaving the military service.

Sufficient attractions will be the title, increased pay, and a bonus on re-enlistment, promotion in the grades, pension on retirement, the right to civil employment and, finally, promotion to a commission.

The period of re-enlistment should be short, since it is easier to subject oneself to a short obligation than to a long one. Besides, this will enable the higher authorities to eliminate those who have lost their usefulness.

The best system of pecuniary reward is one which combines a gradually increasing pay during service with a small annuity at its end.

Promotion to a commission is to be considered as one of the most effective inducements. This prospect, though remote, will be one of the efficient factors towards securing a good corps of non-commissioned officers.

## OATS

See

HORSES—FORAGE FOR

## OBSTACLES

See also

BARBED WIRE ENTANGLEMENTS

ENTRENCHMENTS

## OFFICERS

See also

ENGINEERS—OFFICERS FOR

GREAT BRITAIN—ARMY—OFFICERS

NON-COMMISSIONED OFFICERS

## —Instruction and Training

[How to Train Novitiate Officers. By Prof. S. W. Chichele in the *London Times*. *Army & Navy Jour.*, May 6, '16. 600 words.]

The lessons that have been derived from the over-hasty training of officers in England have their application to us. An officer must be of strong character, and his military knowledge must be part of himself to be applied instinctively on all occasions. He must learn how to conduct himself and to control his men.

## OFFICERS—Continued

Three forms of instruction are available. The first is theoretical,—discipline, organization, operations,—acquired in the officers' training corps. The second is learning the art of command, to be learned on battalion duty. The third is the special knowledge, e.g., machine gun work, to be acquired in special schools.

The proper organization is to give this instruction in the order and by the means named above.

[Brigade, Regimental and Battalion or Group Command. By Lt.-Col. Barrionuevo. *Revista Militar* (Argentina), Mar, '16. 1800 words.]

A general scheme for the instruction of troops, in which methods are indicated and duties outlined for the commands of units from the company, troop or battery, up to and including the brigade.

The regulations establish that preparation for war shall be the sole aim in the instruction of officers and men. A commander, to justify his existence, must be an expert, both in the technique of his profession, and in psychology.

Brigade commanders must know the condition of their regiments. They should attend the inspections at the close of the training periods of the smaller units; conduct critiques, and give their view-points on matters or questions of doubt. They should inspect the regiments at the close of the regimental period: they should personally direct firing examinations (proficiency tests) in the infantry and cavalry, and firing problems in the artillery.

Finally, they are responsible for instruction during the brigade period, and for the preparation and direction of brigade and detachment maneuvers. The duties and responsibilities of commanders of the smaller units are similarly outlined.

[The Complement of Officers. *Revista de Caballeria* (Madrid), Apr, '16. 1200 words.]

The majority of officers who were in active service in the belligerent armies at the beginning of the war are dead or disabled. On Jan 9, 1916, England had lost 7801 officers killed, 2145 missing, and 14,176 wounded. About one-fourth of the wounded are permanently disabled. Adding those who have died of sickness, the losses aggregate 16,000 officers. The new armies require a minimum of 45,000 officers.

To secure officers, training schools were opened at various points in England. Officers' diplomas are given to inexperienced young men after a few months or even weeks of training. The system has given deplorable results.

In Russia, the situation is far worse. Material for officers is scarce. The lack of officers has seriously weakened the army.

France provided for this eventuality. Obligatory service, reserve officers, and men from the ranks have solved the problem.

The Germans have not only replaced the losses incurred in campaign, but have sent hundreds of officers to the Balkans and to Asia. Germany will never lack trained officers. (Here follows a discussion of the German system for providing officers). No shortage of officers has been noticed in Austria.

In Italy the crisis has not yet arrived. She will doubtless have profited by the good example of France and the Central Powers.

## —Resignation of

See also

NATIONAL GUARD (U. S.)—STRENGTH OF (Article: "Resignations of National Guard Officers")

## —Training of

[The Training of Military Officers. By Major I. Libertini. *Rivista Militare Italiana*. May, '16. 8000 words.]

Are military training and instruction necessary for the combatant officer? The answer is that a special sort of training is absolutely indispensable for him. A surgeon who would be successful must be thoroughly familiar with all parts of the human body. An officer who is to command troops successfully should thoroughly understand the workings of their minds and know how to appeal to them. It used to be said that Napoleon's presence on any part of the battlefield was worth an army corps at that point. This was only due to the fact that he inspired his men and knew how to appeal to them. His great mind needed the preliminary training that he received at the military school. An untrained mind cannot associate a number of co-related ideas. Marconi's inventions would never have been possible if he had not had a knowledge of electricity.

Many people believe that this war could have been avoided if the people had wanted to do so. Rather than recognize the importance of the science of war they prefer to see it suppressed. They are naturally opposed to military training.

This brings up the questions: "Is war the product of the human mind or is it a natural phenomenon? What effect does the change of times have on war?"

Our civilization is more advanced than that of past times. The Egyptian, the Grecian and the Persian civilizations were all different from one another. This was largely due to the lack of communication between those different nations. To-day high mountains and oceans are no barriers. The inventions and customs of one nation spread rapidly to another nation. We may say that our civilization is practically universal. We claim this advancement of our civilization over that of the past, yet we find that in our midst we have the same corrupt transactions and dishonesty as existed in the past.

Just before the beginning of the present great war it looked as though the time of universal peace was not far off. Human ideals, however, had to give way to the natural order of things. Science cannot assure the eternity of human life because nature de-

crees that man must die. Moral progress cannot change the nature of man because that depends on his psychological condition and not on his education. He who is born of sin will fall into sin, although he be educated, if he has the weak human structure. If war were not a natural phenomenon, can we imagine the people of Europe slaying one another by the thousands? They certainly have had enough wars to know the sadness it brings. The answer to that question is that war is the result of passions which are natural and which cannot be gotten rid of by education. Time works changes in human but not in natural laws. The means used by man to work out his physical existence have changed, but matter and the material things connected therewith have not changed.

Our armies are colossal as compared with those of former times, and their organization is infinitely more complex than was that of the armies of the past. The Roman soldier carried everything that he needed on his person. He got ammunition from the men left on the field. His food was requisitioned from the country he passed through. The amount of ammunition fired in a modern engagement and the replenishing of supplies requires staff and supply departments that make the organization of an army a very intricate thing. Certainly, the men who have charge of the organization composed of a number of different units must have some sort of special training. We have no reason for believing that the armies of the future will be any smaller than those of to-day.

The training of an officer should be such as to develop coolness and good judgment, for on the field of battle these two qualities may turn the tide of battle for or against his own troops. Are there any moments in the life of a civilian where so much depends on a decision quickly made?

Formerly, officers were drawn from the nobility. The idea of democracy and liberty, and also the necessity for great numbers of officers, require that they be chosen from other than the nobility to-day. Now we have to depend on education and training to give to the officer the prestige he used to enjoy on account of his family and noble traditions.

Naturally, the officers of the lower grades do not require the same amount of training and general knowledge as those of the higher grades. The officers of the lower grades have to instruct the enlisted man who usually has not had a great deal of experience and training. The superior officers have to instruct the inferior officers, and naturally the instruction given them must be of a higher standard than that given to the enlisted men. The system of training should be such that as an officer rises in grade he can easily receive the additional training required for that grade.

Military discipline is not a system of autocratic and tyrannical command, as many believe. It is the first virtue of any efficient

military command, and as such it must have a good moral foundation. It tends to make a man unconsciously obey the lawful orders of his superiors. The military training necessary for the proper discharge of the duties of a certain grade is all that should be required. Anything more might create dangerous ambitions in a young officer. The difference in the amount of training required would permit that learned in one grade to be thoroughly assimilated before the next grade is reached.

Certainly, the training of combatant officers is of the utmost importance, and it is sincerely hoped that we shall profit by the experience gained in the present war.

#### O'HIGGINS, Maurice

[Maurice O'Higgins. By Percy Cross Standing. *United Service Magazine*, June '16. 1600 words.]

(A biographical sketch of an Irishman, 1720-1801, who rose to be viceroy of Peru, and who from first to last worked for South America's good. He was the father of Bernardo O'Higgins.)

#### ORDNANCE

See

#### AMMUNITION

#### —Proving Grounds

##### India

[The Proof and Experimental Department in India. By Maj. C. J. D. Freeth, R.A. *Your Royal Artillery*, July, '16. 1500 words.]

In 1893 some 10-inch common shells were sent from India to England to be proved. This drew attention to the lack of a proving ground in India and led to the establishment of one at Balasare. It was opened in 1896. Balasare is near the coast, 140 miles south of Calcutta. Communication was at first by launch by the coastal canal from Calcutta. This launch still runs, but communication via the Calcutta-Madras railroad has been available for some years. The proof range is at Chandipore, on the coast, about eight miles from Balasare.

A small arms range at Balia, two miles west of Balasare, was sanctioned in 1901. This range was used for the proof of Dum Dum and Kirkee small arms ammunition until 1911. Such proof is now carried out at Dum Dum and Kirkee, and the range is now closed, probably not to be re-opened. The work of the proof department now consists of the proof of all artillery ammunition and of cordite, and the preparation of range tables and other experimental work.

There is an over-water range marked out to 8000 yards. The principal difficulty is the recovery of the shell from the soft sand, especially in the rainy season. An observation party is stationed opposite where the shell is expected to fall, and another behind the gun. The recovery party is thus ranged in, and prod in the sand with long wires where there are indications of fragments having fallen. Few shells are ultimately lost.

The remaining features of the range are

**ORDNANCE—Continued**

not unusual, comprising a velocity range to test cordite, and a 2000-yard range for shrapnel proof.

**OTTO BIPLANE**

[The Otto Biplanes. *Flight*, Nov 12, '15. 250 words. Illustrated.]

The distinguishing feature of the Otto machines is the use of seamless steel tubing for the construction of longerons and struts for the fuselage. Struts are attached to the longerons by means of special steel clips which grip the various members without piercing them.

The wings are attached to the fuselage by means of steel clips so arranged that the wings may be moved a short distance forward or back along the longerons to preserve the proper balance of the machine when it is desired to install a heavier or lighter engine. Wing spars and interplane struts are also made of steel tubing. Struts are streamlined. Stranded steel cable is used for bracing. Although made of steel throughout, this machine is lighter than one of the same size made of wood. The factor of safety for the wings is said to be 8.

The chassis is of the "Vee" type conforming to the usual German practice. The chassis struts are of stream-lined steel tubing and the axle is tubular steel slung by rubber bands. The usual power plant for these machines is the 100 h.p. Mercedes engine.

**OURCQ, Battle of the**

[The Battle of the Ourcq, Sept 1-10, 1914. An Anniversary Study. By F. Ashford White. *United Service Mag.*, Sept, '15. 4500 words. Two sketch maps.]

The vanguard of the British Expeditionary Force arrived at Meaux, 28 miles east of Paris, on Sept 1. The columns were preceded and accompanied by a throng of refugees, the evacuation extending to the banks of the Ourcq. On the morning of Sept 2, the inhabitants of Meaux were ordered to flee, and by the morning of Sept 3 the bulk of the British army was south of the Marne, the bridges blown up and boats sunk. The British left rested on Lagny, practically a suburb of Paris.

A quoted order of Gen. Joffre, dated Aug 25 (published in June, 1915) plans an attack for Sept 2, and indicates that a previously contemplated attack had been given up as impracticable.

On Aug 26, the government departed for Bordeaux, and Gen. Gallieni was appointed military governor of Paris. He pointed out the insufficiency of his force (four divisions of territorials, but was informed that a "Sixth Army" was being grouped by railway south of Amiens. This army comprised six divisions, some of the troops having been withdrawn from Alsace-Lorraine, where they had been roughly handled. It was placed under the command of Gen. Maunoury.

The attacking force contemplated in Gen. Joffre's order of Aug 25 was assembled actually on Sept 3, but on that date Gen. French

was asked to retire still further, "with a view to taking up a second position behind the Seine." Two inferences are obvious—the existence of a plan to assume the offensive before the enemy approached Paris, and that this offensive was postponed through force of circumstances.

On Sept 4, the Germans advanced steadily. Scouts, cyclists, and Uhlans rode through the country east and southeast of Paris, evidently being followed by the main body. This information was confirmed by the Allied cavalry reconnaissance.

At this juncture came von Kluck's diagonal march, which was considered by the French commanders as offering an excellent opportunity for attack.

Gen. Gallieni ordered the Sixth Army to concentrate facing Dammartin-en-Goële, and on the evening of Sept 4 Gen. Joffre issued orders (quoted in full) calculated to take advantage of the risky situation of the German I Army. The Sixth Army, British Army, Fifth Army, and Ninth Army (new) were to take position in order on a line from a point northeast of Meaux to Sézanne and the southern outlets of the St. Gond Marshes. These movements were to be completed by the evening of Sept 5, and the armies were ordered to attack on the morning of Sept 6. Severe fighting occurred on Sept 5 along the line Montgé-Monthyon-Pencharde; but the main action engaged on Sept 6, the day of the orders to the Third and Fourth (eastern) armies, and of Joffre's "die on the spot rather than fall back" order.

The Fourth German Reserve Corps attacked along a line extending northwest from Meaux, but by nightfall had been driven back to the line Chambry-Barcy-Marcelly-Puiseaux-Acy-Etavigny.

The French endeavored to follow up their advantage on the morning of Sept 7, but met determined resistance. German reinforcements arrived, and an attempt was made to turn the French left. Gen. Maunoury was forced to extend his line in both directions, but the German Ninth Corps arrived and gave such a preponderance of numbers that the French left gave way. The combat continued till midnight. The reinforcements of the Germans had weakened the line in front of the British Army, which made an important advance, with little loss. This was due to the fact that the Fifth French Army, on the right of the British, had achieved a signal success, and the Germans were feeling the pressure which culminated in a general retirement. Of this there was no sign along the Ourcq on Sept 8. A terribly severe action occurred south of Acy between the 14th Division of the 7th French Corps and the Second German Corps, with extremely heavy casualties on both sides.

On Sept 9, the pressure on Gen. Maunoury's left flank became heavy and menacing, and by 5 p.m., his situation appeared desperate, and the retreat had begun. Maunoury ordered the ground held at all cost, and even to advance regardless of sacrifice.

The pressure of the British and Fifth French armies on von Kluck's flank now be-

came decisive. During the night of Sept 9, orders were sent for a general advance, and Gen. Maunoury's forces advanced to the attack at daybreak on Sept 10. The German resistance slackened, and they presently retired under cover of their artillery, their rear guards pursued by the French cavalry. Although thousands of prisoners and some light guns were captured, the German retirement was accomplished in order and they carried off all of their heavy artillery.

## OUTPOSTS

See also

TACTICS—INSTRUCTION AND TRAINING—  
TACTICAL PROBLEMS—OUTPOSTS

TACTICS—INSTRUCTION AND TRAINING—  
MAP PROBLEMS—OUTPOSTS

## PACK

—Infantry

See

INFANTRY—EQUIPMENT—PACK

## PANAMA CANAL ZONE

—Military Service at the

[Service in the Canal Zone. By Capt. W. H. Waldron, 29th Inf. *Infantry Journal*. Feb, '16. 5800 words.]

The rainy season lasts from May 15 to Dec 31, during which time there are daily rains of varying intensity and duration. Quarters are fairly substantial, with porches and screened. There are shower baths in all quarters and barracks. The larger quarters have servants' rooms. Each set has a dry room to prevent mildewing during the rainy season. There are electric lights in all quarters. The quartermaster furnishes a few articles of furniture. An all-metal refrigerator should be brought from the States. Wicker furniture is the most suitable. Pianos are a constant care. Rag or Crex rugs and light muslin or cotton goods for hangings can be bought here, and any other material is unsuitable. Porch swings and canvas camp chairs are almost necessary. Distilled water is furnished for drinking; that for cooking and washing is pumped into the water system of each camp. Bituminous coal is used for cooking. Valuable framed pictures deteriorate rapidly. Flat silver can be cared for without much trouble. One light woolen blanket is needed for each bed. Cotton mattresses stand the climate well if frequently aired and sunned.

The commissary stores of the Panama R. R. Company carry practically anything required at very reasonable prices. Fresh vegetables and fruits arrive at stated intervals and are preserved in excellent condition by cold storage. The native mango is poor compared to that of the Philippine Islands. Alligator pears, pineapples, papayas and bananas are fine. Cooks and maids generally unsatisfactory, and laundresses, generally very satisfactory, are available in great numbers. There are good schools for children from 12 years up at Balboa; a school ranging from first to sixth grade has been established at Empire.

The uniform is worn at all times. Olive drab, white dress and mess jacket uniform should be brought from the States, as tailors in the zone are not very good. For the ladies and children, wash goods only should be brought. Anything else is a great care. Mail order shopping requires 3 weeks from New York and is very satisfactory. Bathing, fishing, hunting, baseball, dancing and tennis are the principal diversions. The 10th Infantry is working on a golf course. Officers ordered to Panama should write the adjutant of their regiment at least a month ahead to secure transportation on railroad and boats. The Panama R. R. Company operates a line of comfortable boats. Their New York address is the Panama R. R. Steamship Line, 24 State St., New York, N. Y. Schedule of sailings of the United Fruit Company boats, sailing from New York and New Orleans can be had by applying to the New York or New Orleans offices.

Roads are good but very limited in extent. There is little use for an automobile if stationed on the west side of the canal. The Panama tax is \$25. If a car is needed it should be bought in Panama, after looking over conditions of travel and upkeep. Motor boats, except when stationed at Gatun, are considerable trouble, as they can not be kept accessible and traffic conditions on the canal practically prevent their use. There are two mails per week. Packages should all be mailed to the Post Exchange with an inside separate wrapper addressed to the owner. Cable service, direct to Galveston, and also via Kingston, Jamaica, is at the rate of 43 cents per word.

Three hotels are open to the public. The Tivoli at Ancon, a suburb of Panama, is excellent and reasonable. The railroad company, which owns the hotels, also operates the Ancon Hospital of 800 beds. The staff of physicians and surgeons is the best obtainable in this part of the world, and includes men of experience and several experts in tropical medicine. Rates are \$3.50 per day with additional charges for operations and special service. Typewriters may be kept in dry rooms. No great care is required during the dry season. Books are soon ruined, and only necessary ones should be brought. They can be kept in dry rooms. A good New York daily paper, also other reading matter, should be arranged for. The Infantry Association will arrange this for you. It is best to have your account with a reputable New York bank. This should be arranged before leaving. The brigade post project is held in abeyance for the time being. Each infantry regiment has a range, and conditions for target practice are fairly favorable. In the future, target practice will be held in the rainy season so as to allow the dry season to be devoted to field training, reconnaissance work and maneuvers.

## PATROLS

See also

TACTICS—INSTRUCTION AND TRAINING—  
TACTICAL WALKS

**PAY, Army****Canada**

[Canada's Liberal Pension System. *Army & Navy Jour.*, Apr 8, '16. 700 words.]

Canada is providing for a more generous pension system than that of our own government in the Civil War. Furthermore, the Canadian government is paying enlisted privates in the expeditionary forces \$1.50 a day with more liberal allowances than our Regular Army, and n. c. o.'s in some grades get as much as \$4.00 per day. These figures must be faced as a result of dependence upon the volunteer system.

**PEACE PROPAGANDA**

[A Pacifist Letter and a Reply. *Infantry Jour.*, Nov '15. 4500 words.]

(A letter circulated to 80,000 college students since Mar 30, 1915, purporting to inquire relative to the impressions gained at students camps. The reply of a student and some comments by Brig. Gen. C. A. Woodruff, U. S. Army (retired) are given containing replies to the implied criticisms of the objects of students' camps.)

See also

EUROPEAN WAR—PEACE NEGOTIATIONS

**PENINSULAR WAR**

[Some Peninsular Letters. By K. E. Younge, *United Service Magazine*, Feb, '16. 4000 words.]

(A historical article.)

[The March of Crawford's Light Brigade to Talavera: July 28-29, 1809. An Old Legend corrected, from the papers of Sir John Bell, K.C.B. By Professor C. Oman, M.A. *The Journal of the Royal United Service Institution*, May, '16. 6000 words.]

(Sir William Napier stated, in his second volume of "The Peninsular War," that Crawford's Light Brigade marched 62 miles in 26 hours. This, if correct, is a record for rapid marching of large bodies of troops. The author seeks to establish what he believes to be the approximate distance marched,—not much more than 40 miles; and that the rate of march averaged one and one-half miles per hour for the entire distance.—Ed.)

**PENSIONS****Canada**

[Inadequate Pensions. By A. T. T. *The Canadian Military Gazette*, Jan, '16. 500 words.]

The present scale of pensions in Canada is entirely too small throughout, but particularly so in cases of total disability. These pensions must be increased at once regardless of the heavy taxation it imposes. Those who have gone to the front and have been wounded represented those who stayed at home and the latter must now pay.

A totally disabled man with no other income cannot possibly live on \$22.50 per month. Many such are being returned to Canada now and it is expected that Parliament, which met Jan 12, 1916, will soon take up the readjustment of pensions.

**Great Britain**

[*Bis dat qui cito dat. The Army and Navy Gazette*, Dec 4, 1915. 400 words.]

The government has made generous provision for the widows of officers killed in action, or who have died of wounds or disease. Especially is this so when it is considered that these pensions and gratuities are awarded according to rank and are independent of length of service. These are given with the idea of affording immediate relief, but we hear of cases where the gratuity is not over-readily forthcoming—delays which are wholly inexcusable.

The War Office might well take example from the manner in which in India the grants of the "Military Widows' Fund" are disbursed. A committee is at once called together in the place where the widow is living, to decide upon the grant to which she is entitled. The report of the committee is forwarded to the headquarters of the fund, and in the meantime a copy of it is sufficient authority for the local paymaster immediately to make an advance to the widow. With new officers unacquainted with the rules under which they are serving, knowing little or nothing of what may be due their widows in the event of death, it seems that we have a right to expect from the authorities something more than they are giving. It does not seem too much for the War Office at once to put itself in communication with the widow and, with as few formalities as possible, to place at her disposal a substantial advance on account of the gratuity to which she is entitled according to the rank held by her husband.

**PERISCOPES**

—For Artillery Fire Control

[Photo and Description. *Popular Science Monthly*, Nov, '16. 100 words.]

(The photograph shows a Zeiss field periscope captured by the French during the earlier battles of the Somme. A cart or limber carries a collapsible tube which serves as a periscope. The tube can be extended to 50 feet in height, with only the support of the cart, and with guys can be extended to its full height of 85 feet.)

**PERU**

—History

See also

CHILEAN—PERUVIAN WAR  
SAN MARTIN, GENERAL

**PHOTOGRAPHY**

—Submarine

[A New Method of Submarine Photography. *Memorial del Ejército*, (Madrid), Oct, '15. Taken from *The Electrical World*. 200 words.]

An apparatus has been devised to take submarine photographs of fixed or moving objects. It consists of a large tube of impermeable canvas built in accordion form, reinforced at intervals with iron hoops. It is of sufficient diameter to permit a man to pass through; and at the lower end is a

chamber about 1.5 meters in diameter provided with a heavy glass window through which the pictures are taken. The tube is lowered over the side of the vessel to a suitable depth below the surface of the water and two men operate the camera and a light of 2400 candle power in the chamber.

—Use of in European War

[Use of Photography in the Present War. *Memorial de Artilleria*, June, '16. 1500 words.]

It is well known that officially organized photographic sections exist in the armies of the belligerents on both sides. These are charged with preserving in pictures all the incidents of any importance which merit graphic reproduction either as documents of technical military information or as historical documents. And in some armies—principally in the German—there exist not only photographic sections but also cinematographic sections for the purpose of obtaining the most complete information possible.

Thanks to the use of tele-objectives, photography is an extremely valuable element in military reconnaissance. With a camera of small size and light weight it is possible to obtain photographs of fortifications and enemy's positions from a distance of four, five or more kilometers in practically complete security.

PICHINCHA, Battle of

[The Battle of Pichincha. By Lawrence Villanueva. *Revista Militar del Estado Mayor General* (Ecuador). June, '16. 2400 words.]

[An historical non-technical sketch of this battle, won by General Sucre, May 22, 1822, at a height of 10,200 feet above sea level, in the revolution against Spain. A complete victory for the rebels, it secured the independence of the country.]

PLANE-TABLE

See

SKETCHING—PLANE-TABLE TRIANGULATION

POLO

[The Duties of a referee. By 1st Lt. I. P. Swift, 2d Cavalry. *Jour. U. S. Cavalry Assn.*, Apr, '16. 3800 words. One plate.]

(A detailed description of the duties of a referee in polo.)

PONIATOWSKI, Marshal

[Napoleon's Polish Marshal. By Percy Cross Standing. *United Service Magazine*, Sept, '16. 1300 words.]

(A brief summary of Prince Poniatowski's military career with Napoleon.)

PORTUGAL

—Army

See also

ADMINISTRATION, MILITARY—PORTUGAL

—Army—Artillery

See

FIELD ARTILLERY—ORGANIZATION—PORTUGAL

POSTS, Military

See also

BARRACKS

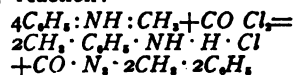
POWDER

[Notes on Modern Powders. By J. R. Fiegenspan, Captain Professor of the Artillery Academy. *Memorial de Artilleria*, May '16. 7000 words.]

Progressive powders are those in which the rate of emission of gas increases from the time the projectile starts until the combustion is completed. Degressive powders are those of which the contrary is the case. As the initial emission of gas depends on the surface of inflammation, reducing this will result in delaying the moment of maximum pressure and in a consequent increase in progressiveness. As the most practicable means of securing such reduction, various hydrocarbons have been added to the outer layers of the grains, the velocity of combustion of these hydrocarbons being less than that of the nitrocellulose. These are added so as to increase in amount from the center of the grain to its surface.

Progressiveness has also been attained by an increase of density and changing the system of graining by use of presses and cutters. With the presses better homogeneity is obtained. The increase of density is also necessary in this class of powders in order that the impregnation may not reach the center of the grain. This impregnation was first secured by means of a solution of camphor in alcohol, but as camphor is very easily volatilized trouble resulted, since volatilization from the outer layers resulted in greatly increased pressures without any compensation in velocities, thus transforming the powder into a degressive one.

To avoid this, the use of centralite was proposed. Centralite is obtained by the action of carbon oxychloride on methylaniline in benzene or toluene solution according to the following reaction:



It may also be obtained by the action of a cyanic ether on ammonia, or better by treating an amide with cyanic acid.

Its point of fusion is between 118° and 122°. It is a white crystalline salt. It is insoluble in water and soluble in ether and alcohol.

(Various theoretical computations concerning powder treated as described above and other powders follow, but are too technical for abstraction.)

See also

EXPLOSIVES

PREDICTOR

See

COAST ARTILLERY—RANGE FINDING—PREDICTOR

PREPAREDNESS FOR WAR

[The Best Arguments for National Preparedness, by the Hon. Lindley M. Garrison.

**PREPAREDNESS FOR WAR—Continued**  
 Secretary of War. *The National Guard Magazine*. Jan. '16. 3500 words.]

What is termed civilization exists only because of government, and government, in order to exist, must possess sufficient force to compel obedience to the law. Otherwise, anarchy results.

Certain persons insist that it is impossible for our country ever to become involved in a war, and that therefore preparedness is unwise and unnecessary. A state of war has very frequently existed from the very earliest times and there is no reason for believing that soon it will have been entirely eliminated.

Others admit the future possibility of war but advise against preparation therefor, claiming that a possession of force would be an inducement to use it. This position is untenable because it does not take into consideration certain grave responsibilities which we have undertaken and which must be maintained at any cost. Neither does it consider the fact that, if nations possessing force are thereby inclined to use it when they should not, some nation which has such force might use it against us when it should not.

Many people are blinded by the fear of what they call *militarism* but have no conception of the real meaning of the term. Real militarism consists in making the ordinary processes of government subservient to military influence, and those who object to it should be the strongest advocates of reasonable preparedness, for it is a guard against militarism. If adequate preparedness be defeated now, the inevitable result of any great humiliation in the future would be ill-advised increases in armament tending toward militarism.

Still other persons insist that the horror and devastation produced by the present war will prevent all war for a long time after its close, but history gives no reason to believe this. Our colonies had just finished the wars with the Indians when they began the Revolution. Other examples could be given.

Those who contend that arbitration can always prevent war are reminded that preparedness will in no way affect the arbitration of differences or retard the day when such will be the universal custom.

Finally, in making comparisons between the cost of military establishments in this country and abroad it must be remembered that here the standard of living is higher and that wages, food, fuel and clothing are much dearer than in Europe.

[A Lesson from Canada. Editorial. *Independent*. Mar 6, '16. 1000 words.]

In 1911, England appealed to her oversea dominions for assistance in keeping her navy up to the required strength. It was necessary to call the colonial premiers and defense ministers to London and explain the situation and necessity to them personally and privately before even these colonial representatives could be convinced.

The Premier of Canada made a strong speech in Parliament on Dec 5, 1912, asking for an appropriation of \$35,000,000 to construct ships "urgently required *within two or three years at the outside* for rendering aid upon which may depend the Empire's future existence." But the Premier could not convince the people without revealing the secret policy of Great Britain, and the Canadian Parliament refused the appropriation.

The lesson is that in a democracy you must explain what you want a thing for before you get it, and it will never be possible for the President to secure any very great increase in military power unless he is at liberty to make public the reasons for the necessity.

[Preparation for War. By General Carlos Banus. *Revista de Caballeria* (Madrid), Apr, '16. 2600 words.]

The Allies explain the German successes and excuse their own failures by saying that Germany expected the war and was armed to the teeth, while they were unprepared. This cannot be admitted in its entirety. Since the defeat of 1871 France has not neglected military preparation. She introduced obligatory service, created a War College, and improved her armament. The French field artillery is held to be the best in the world.

Russia increased her army after the Russo-Japanese war, improved the system of military railroads, and strongly augmented the garrisons in Poland. The best proof of Russian preparedness is the celerity with which her armies mobilized and took the field. Heretofore the invariable custom of Russia has been to arrive late. Had she not made preparation for war, the rapid invasion of East Prussia in Aug, 1914, would have been impossible.

England was unprepared in that she depended upon the fleet, and thought that the despatch to the continent of a small expeditionary force would be sufficient.

Germany had no illusions as to the attitude of Italy. The Alliance with Italy was tolerated by Germany and Austria only because there was a possibility of her remaining neutral.

The industrial and scientific superiority of Germany is recognized by her adversaries. The mobilization of this industry and science for the services of the armies has enabled Germany to carry on the war, and to endure the blockade without material aid from the outside. The peculiar psychological preparation of the people is the most important of all the factors that have contributed to German success. Unity of direction in the disposition of the military forces—which the Allies have lacked—has been made possible by the personality of the Emperor.

It is not enough to-day to have an army prepared for war. There must also be industrial organization based upon scientific principles of efficiency. The nations which have united, as they say, to combat Prussian militarism and organization, now admit that



it is necessary for them to imitate German methods. Social discipline is a virtue, not a vice.

[Personnel versus Matériel in Plans for National Defense. Prepared by War College Division, General Staff Corps. *Jour. Mil. Service Inst.*, May-June, '16. 5500 words.]

(The article is summarized by its authors in the following conclusions:)

The present European war has demonstrated:

1. That the leading of an untrained or partially trained and ill-armed citizen soldiery against an army of trained veterans, with all the equipment of modern warfare, results in useless, senseless slaughter.

2. That in direct proportion as warfare becomes more scientific, complicated and expensive, does it require longer time to prepare for war, both in the enginery of war and in the making of the soldiers.

3. That the United States cannot rely on having time to raise and equip new armies after the declaration of war, unless we have allies with well-trained armies to stand between us and disaster while we are preparing. Our traditional policy has been against entangling alliances.

4. That in making deductions from the operations and events of the present European war, we should consider the events not alone in France and Flanders, and the Dardanelles, which have developed into siege warfare, but the operations in other theaters which approximate more closely what would happen in the United States should they be attacked.

5. That it is necessary to have on hand at the beginning of war matériel for the equipment of all troops to be mobilized during the first three months of the war, and that this equipment should be accumulated by complete division units.

6. That modern armies, to be successful, must be well balanced; that is, composed of the proper proportions of infantry, cavalry, artillery and special troops, and that, if any arm or corps is lacking in time of peace, successful military operations will be delayed until it is brought up to its due proportion.

7. That in the wars of the future matériel will play a very important part, but, in the last analysis, that side will be successful, other things being equal, which can longest supply reserves of adequately trained and disciplined officers and men.

[Why Preparedness? The Observations of an American Army Officer in Europe. By Captain H. J. Reilly, F.A., N. G. Ill. Chicago: Daughaday & Co., 1916.]

The author of this book, who resigned from the United States Army in 1913, has enjoyed the unusual advantage of seeing the Belgian, French, English, German and Austro-Hungarian forces at work. He gives us a graphic picture of the battlefields from the North Sea to Switzerland, from the Baltic to the Carpathians. There is much in this book to make the American public think. The author has

produced a book of interest and value, not merely because of the advantage mentioned above, but still more because he makes plain our own helplessness. Hence the title. Many photographs are reproduced, mostly taken by the author, and there is a good index.

[From *Journal U. S. Artillery*, July-Aug., '16.]

See also

EDUCATION, MILITARY

UNITED STATES—MILITARY CONDITIONS

See also subhead MILITARY POLICY under names of specific countries.

—By Red Cross Society

[Organization for Preparedness Begun by Red Cross. *Arms and the Man*. Feb 17, '16. 1400 words.]

The American National Red Cross has recently taken up the development of a branch of its force in preparation for war. It classifies its obligations to the armed forces of the United States under three headings, funds, personnel, and supplies, and is now preparing to meet these obligations in time of war.

To meet the first obligation the association is organizing in all parts of the country chapters composed of representative people, whose influence will be of assistance in the collection of funds in time of war to carry on relief operations.

The question of supplies is also being considered. The chapters are now engaged in the manufacture of non-perishable hospital supplies to be stored in twelve depots located in different parts of the country where they can be requisitioned when needed.

The Red Cross has established a new department known as the Department of Military Relief, in charge of Maj.-Gen. Arthur Murray, of the United States Army, as director general. The latter, together with the central committee, is working out the details of the following organization of the personnel. It is divided into three classes: Class "A," those willing to serve wherever their service may be needed, Class "B," those who will serve in the home country only, and Class "C," those willing to serve at place of residence only.

Class "A," composed of physicians, surgeons, nurses, dentists, pharmacists, clerks, stenographers, typewriters, cooks, attendants, chauffeurs, litter-bearers and transport personnel are to be organized into field, hospital and supply columns and information sections. Field columns will be used to supplement and assist the regular sanitary columns of the army and navy. The hospital columns will supplement and assist military hospital formations, perform ward services, manage kitchens and laundries and other branches of hospital work.

Supply columns are to be given practical training in methods of supply for sanitary service.

Information sections are to be trained in methods of correspondence and of obtaining from the military authorities information concerning the sick and wounded and the dead, with a view to transmitting it to relatives and friends.

**PREPAREDNESS FOR WAR—Continued**

Prior to their acceptance by the armed forces, various divisions are under the control of the central committee of the American National Red Cross, but upon entering military control they are to be placed under the medical officers of the army and navy.

**—Effect on Social Life**

[The Physical and Moral Regeneration of the Race by Military Training. By Capt. P. Consiglio, Italian Medical Corps. *Rivista Militare Italiana*, Jan, '16. 10,000 words.]

(A sociological investigation of the subject more or less general in character. Some idea of the physical improvement of the recruit may be formed from the statistics given.—Ed.)

**—Mobilization of National Resources**

[The Mobilization and Supply of Army Material. By Martin J. Gillen. *Jour. of the Mil. Service Inst.*, Nov-Dec, '15. 4700 words.]

This is a plan for making available for military use in war the supplies and manufacturing resources of the country.

A general advisory board would be created, consisting of one representative of each separate industry, such as railroads, motor trucks, horses, shoes, drugs, small-arms, etc. (34 industries are mentioned and many others implied). The board would be under the Secretaries of War and Navy; representatives of these and other governmental departments being members. The secretary of the board would be given a military commission, and, with two assistants, be paid by the government. In time of war all members of the board would be commissioned.

The President of the U. S. would appoint not fewer than 5 representatives from each industry. This group would elect one of its number a member of the general advisory board, and in this way the board would be constituted. Members of the general board and of groups would be paid actual expenses, only.

The government would present to each group plans and specifications for all needed supplies of that kind. Within 30 days the group would return the papers with recommendations of changes made desirable by factory equipment, raw stock, etc. Standardization would result. Plans and specifications would then be corrected and samples constructed, wherever practicable, and distributed among the prospective producers. The books of suppliers would always be open for inspection as to costs, etc.

Each group would report to the government the name and capacity in 90 days of each producer. The government would call for bids on its war needs from each group every six months, for supplies that would be needed by one or one-half million of troops. Contracts would be made and in case of war it would be necessary only to notify contractors to begin work.

The delay and expense suffered by the Allies is largely due to unsuitability of factory equipment, misunderstanding of specifications, etc., all of which would be avoided

by these plans. A register would be kept of all factories, etc., that could be diverted to the production of needed supplies. The government would control by law the raw materials of explosives. Records would be kept by the bureau of industries and the War Department and information furnished as needed.

Annual exhibitions would be held by the War Department for the display of all new creations, and prizes awarded for productions of value. A weekly supply journal would be issued for distribution to all concerned. It would contain prices and deliveries offered by each producer, etc., and also contain articles on important subjects, written by experts.

Under this plan it would not be necessary for the government to carry on hand supplies much greater than the needs of the standing army; with the exception of material that takes a long time to construct or is supplied by a limited number, such as arms and ammunition.

[Echoes of the European War. VIII (continuation). Industrial Mobilization. By José Paulo Fernandez, Capt. of Artillery. *Revista de Artilharia*, Feb, '16. 2750 words.]

(The necessity of industrial mobilization as emphasized by the experiences of the European War.)

[The Dye Industry as a Factor of National Security. Editorial. *Scientific American*, June 3, '16. 900 words.]

We have learned many things from the European war—that numbers count for little; that it takes months to make a soldier; that a fortress is valueless; that heavy artillery is essential; and that machine shops must work night and day to supply munitions. One startling revelation is the intimate relation between the dye industry and preparedness.

Our own dye industry has been allowed to languish. Now we find that *within a week or ten days a dye factory can be made into a high-explosive factory*. The materials are the same, and the processes the same up to a certain point. After eighteen months of feverish activity, we are in a position to manufacture 33 tons of carbolic acid per day, corresponding to about 80 tons of picric acid, and equivalent to 53,000 shells per day. If we manufactured all of our own dyestuffs, it would correspond to a production of 100 tons of high explosive per day. The industry should be protected and developed.

[Our Industrial Mobilization. Legal Considerations. By Capt. Leonetti. *Rivista Militare Italiana*, Jan, '16. 7000 words.]

(Last installment of a continued article. The Royal decree, June 26, 1915, announcing regulations for the supply of war materials, is given in full.)

[National Defense—For Engineer and Contractor. By Major P. S. Bond, Corps of Engineers, U. S. A. *Engineering Record*, Mar 4, '16, et seq.]

(Part 8, Mobilization of the Nation's Material Resources. Apr 22, '16. 4200 words. 2 photos.)

Modern war demands not only a highly trained personnel, but also the complete mobilization of the material resources of a nation. Unless the necessary supplies of weapons, of ammunition, of food and clothing are forthcoming, all the strength and skill of an army will go for naught, as has been more than once demonstrated in the present war.

The study of this vast problem involves:

- (1) a consideration of the probable needs;
- (2) an investigation of all sources of supply;
- (3) stimulative measures for rapid production.

Materials required may be divided into two classes: those commercial implements ordinarily available, and the tools peculiar to warfare and not commonly manufactured. A suitable reserve of this second class of material is especially necessary. The plans of the general staff will indicate the minimum requirements in this respect, and the probable rate of production desired in case of war.

Coincident with this tabulation of probable needs, all sources of supply should be investigated. Automobiles and animals which can be commandeered in case of necessity should be located and listed; factories investigated not only with regard to their regular output, but considering what they might be expected to produce for military use.

Stimulative measures to increase the rate of output must be thoughtfully planned in advance. Thus specifications can be submitted to the scrutiny of manufacturers, experimental samples produced and placed with important factories, and the aid of the manufacturers themselves involved in working out this problem.

The labor question is an important one in this connection. The reorganization of the industrial personnel for the needs of war, the increased employment of women, the needs of the civil population at home, the alleviation of the hardships incident to such changed conditions of living—these are some of the problems which must be carefully studied in advance.

In all these problems, the services of the engineer are absolutely necessary. Steps have already been taken by the President of the United States to enlist the aid of the national engineering societies, and these bodies have responded enthusiastically.

Our transportation systems, on which the demand will be so heavy, must have a careful stock-taking. The question of war prices must also be thoughtfully considered, and steps taken to prevent excessive profits to any special interests.

Such mobilization will cost money—we cannot get something for nothing. But in the event of war, the returns on the investment will be large. America possesses wealth and natural resources exceeding those of any other nation; but this inherent advantage will be

utilized only if it is adequately mobilized in time of peace.

[Industrial Mobilization. The Wool Manufacture and Its Part in National Defense. Editorial. *Bulletin National Assn. Wool Mfrs.*, Apr, '16. 2000 words.]

The importance of industrial mobilization is beginning to arouse serious attention. The question is a new one to lawmakers and to the people, but some business men recall the blundering but unsuccessful efforts in the Civil War to co-ordinate governmental and industrial activities. The railroad and telegraph systems were taken over where necessary, but in munitions and supplies the government dealt with individual manufacturers with unsatisfactory results in many respects.

National emergencies in war should not be seized as an opportunity for undue profit, yet reasonable profit should be allowed the manufacturer for the same reason that the military forces should be paid for their services.

The subject of industrial preparedness was discussed at the annual meeting of the N. A. of Wool Manufacturers by the President, Mr. J. P. Wood. The government has recently inquired of woolen mills their normal and emergency capacity. Mr. Wood believes that such an inquiry will be barren of results. He advocates a small committee of the ablest men in each industry to confer with officers of supply departments and to report what arrangements should be made in advance to insure to the government prompt, adequate, and economical service. The membership of such a committee is outlined. (President, representative of army, navy, marine corps, and three representatives of the wool industry.) Such a committee could study requirements and capacity and formulate a plan:

- (1.) To supply the requirements of the army, navy, and marine corps.
- (2.) To make provision for annual option contracts having in view the purchase of necessary supplies.
- (3.) To make provision for similar contracts for a definite proportion of stocks on hand, with definite provision as to price.
- (4.) To provide for the manufacture of material of blends, quality, and color desired.

By such a plan the largest output would be possible in the shortest possible time. A less comprehensive scheme would involve speculative rises in prices of raw materials, derange civil supply, and introduce other objectionable conditions, including that of possible fraud and adulteration.

By such an arrangement the government would be in a position to secure the best service, and the difficulties which the Allies have had in arranging for purchases of supplies would be avoided.

[Organizing Industry for National Defense. By Howard E. Coffin. *World's Work*, May, '16. 4400 words.]

(Mr. Coffin is the chairman of the Committee on Industrial Preparedness of the Naval

**PREPAREDNESS FOR WAR—Continued**

Consulting Board. His plan for solving the vital problem of industrial organization is approved by the President and by the Secretaries of War and of the Navy, and has the cordial co-operation of the five great engineering societies. This work is being done as a patriotic service, without pay, by the members of the board.—Ed.)

Our preconceived notions of war have been entirely upset by the European situation. It is no longer the question of an army or a navy; but the question of what country can fastest and longest supply shells and other munitions to the guns and men at the front. Every bit of the industrial brains of the country must organize behind the Army and Navy, to find out what the country can produce, to apply this knowledge practically, and to organize the skilled labor for its proper function—that of staying at home in the factory while the banker, the tradesman, and the statesman fight at the front.

In order to organize the engineers of the country in this service, the Naval Consulting Board, through the President, enlisted the aid of the national technical organizations, and organized in each state a board of five directors. These boards are making, first of all, a business inventory of some 30,000 concerns,—full and accurate reports made by trained engineers.

Secondly, we purpose to give the private plants of the country small annual orders for munitions. No manufacturer can start on quantity production of shells within a year from receipt of orders unless he has previously done shell work in his plant.

This step ensures the elimination of many delays. Each department must learn its special function; specifications will be understood and standardized; arguments gotten out of the way and difficulties overcome. Such a course will not preclude the establishment of government munition plants, a certain number of which should be established in the middle West, but the latter are not all-sufficient.

The third step is to gain the support of skilled labor. This will be assured with the establishment of a governmental price on munitions, and the assurance to the skilled mechanic of an honorable place in the factory instead of at the front.

Few people have any conception of the intricate problems involved in such preparedness. As a nation we are not at all prepared to supply an army with all its wants. It has taken substantially a year for American manufacturers, with every incentive and advantage, to turn out their first rifle for European use. If the Allies were whipped, one of their representatives has said, it would be because the United States had failed to make specified deliveries of rifles ordered.

"The plan of the Naval Consulting Board is first to get an accurate census of manufacturing plants, secondly to have them equip themselves with the necessary tools and train themselves by making a small amount of

munitions each year, and thirdly to enlist skilled labor in the service of the Government to make munitions in time of war rather than to go to the front. Without some such co-operation of industry, if a war come we shall send our soldiers, be they regulars, militia, or volunteers, to the front to slaughter and defeat."

[The Industrial in Modern War. By Naval Constructor R. D. Gatewood, U. S. N. *Proc. Naval Institute*, May-June, '16. 5500 words.]

The great military lesson of the present war is the lesson of munitions, for the successful conduct of war now demands organization to the last detail of all the resources of the nation, in men and in material. Modern warfare has developed into a national industrial undertaking as much as a specialized military one. To form some idea of the importance of industrial organization, in the Allied offensive of Sept. 25, 1915, over 1,000,000 shells were fired by the French 75's alone. As these shells weigh eighteen pounds each, 10,000 tons were expended. It takes five hours to make each shell, so that 1,000,000 took 5,000,000 hours, or the work of 625,000 men for an eight-hour day. If 600,000 men were engaged in such a battle, and if it lasts eight hours, then it takes 25,000 more men to make the shell than it does to fight the battle.

What should we do to organize our industrial resources so as to avoid the delays that have so far been so disastrous to the Allied cause?

(The remainder of the article is an answer to this question. The principal points made are: Government arsenals being of necessity inadequate, Congress should create a Department of Munitions, whose duties in time of war are defined. Compensation should be made for plants commandeered, and a register of plants drawn up. Decentralization should obtain to the extent of establishing not fewer than ten munition areas, each under an expert civilian engineer. Skilled mechanics should be registered, and not allow to enlist in either army or navy. Provision should be made against lock-outs and strikes; the possibility of the limitation of output taken in hand and the question of profits regulated. The department should assume control of materials, and tribunals be established, one in each "munition area" to pass upon the many disputes and differences sure to arise.)

[Mobilization of Resources. By Major A. Ewing, Chilean Army. *Mem. Del Ejército* (Chile), Aug, '16. 1400 words.]

In the European war the greater number of industries have played an important rôle in the national defense. This co-operation, in some countries, has been the result of a preparedness plan carefully worked out in peace time. In others, it has been an improvised machinery established after the war commenced.

[Industrial Mobilization in the United States. *La Guerra y su Preparación*, Aug, '16. 11,000 words.]

(A discussion, from various sources, of the steps that should be taken to organize our industries with reference to national defense. This compilation includes quotations from the *N. Y. Times* and *Herald*, reports of committees, besides an introduction on the general state of the question by the military attaché of Spain to the United States.)

#### France

Through the Dalbiez law, the government assumed control of all factories which in any way were engaged in the manufacture of army supplies.

#### Germany

In a general way, the manner in which all industries should co-operate in the national defense had already been provided for in peace time. The details of the system are not known, but its wonderful results are. On the first mobilization day, practically all industries became government institutions, and, in spite of the great number of workmen called to the colors, the output has been greater than in normal times.

As a result of these experiences public opinion in the United States has taken a deep interest in this problem.

Everyone knows that the "change of private industries to army service" cannot be made in a day. It requires a long and careful previous study, so that in the mobilization of industries two distinct phases may also be considered: preliminary work and the carrying out of the mobilization.

In the preliminary work an effort is made to ascertain the quantity of each article needed in case of war in order to find out where the articles may be obtained. A convenient classification to determine the quantity of articles needed is as follows:

- (a) Armament, munitions, explosives, etc.
- (b) Clothing and equipage.
- (c) Technical material.
- (d) Transportation.
- (e) Medical and sanitary supplies.

Once the quantity of articles needed is fixed, it will be necessary to study the form in which requisitions should be made, and the following classification is required:

- (a) Articles which can be obtained in the country, in large numbers and at any time.
- (b) Articles which require about 15 days for their manufacture.
- (c) Articles requiring several months to be manufactured.
- (d) Articles which cannot be obtained in the country.

The preliminary work may be summarized in the following manner: to ascertain what there is in the country; determine how it can be utilized, encourage the national production of certain articles; and get in large stocks of those which cannot be obtained in the country.

As regards the carrying out of the mo-

bilization, that is to say, what should be done by the industries once war is declared; it depends on the degree of precision and minuteness with which the preliminary work has been done. It will be necessary to stimulate inventors, aid industries, and encourage the artificial production of certain articles.

In the United States everyone agrees that it is necessary to face this problem with an essentially national spirit and starting from the following bases:

- (a) That there is no greater mistake than that of neglecting the development of industries manufacturing war supplies or any articles which may be needed in time of war.
- (b) That every cent invested in peace time for the purpose of encouraging these industries, is returned a thousand fold in time of war.
- (c) That the industrial problem should not, in the future, be regarded only as an economical question, but more attention should be paid to its relation with the National defense.

The General Staff of the United States in a recent publication (*Utilization of the Commercial and Industrial Resources for War Purposes*) states that to its technical-military functions it will be necessary to add a thorough study, in preparing for war, of the industrial, agricultural and economic capacity of this country and of the neighboring countries. There is no doubt, it is added, that this task will be a long and difficult one; but for it specialists should be resorted to.

A tentative bill along the above lines has been submitted to Congress.

#### Great Britain

Shortly after the opening of the war, the government assumed control of all industries which could be utilized in the manufacture of munitions, and a special minister was appointed. Parliament, without opposition, passed the "Law of Mobilization of Industries."

[A Mobilization of Industries and The General Staff. By Charles Stuart-Linton. *United Service Magazine*, Aug, '16. 2400 words.]

A campaign to be prosecuted successfully cannot any longer be fought only with men, small arms, guns and money, however essential these elements are in the complex science of war. Financial strength will not of itself create either trained armies or munition factories. All the national resources and the national energy and the capacity of well-developed organization behind "the lines" must supplement the men, the rifles and the guns. For years all European nations had worked out elaborate plans for the mobilization of their male population, for swelling their armies on the outbreak of war. Only Germany, however, was sagacious enough to pay much attention to a mobilization of her industries in order to supply her enormous field armies with unlimited munitions. Just as Germany for years had been the most

**PREPAREDNESS FOR WAR—Continued**

completely organized state in the sphere of government and in things military, so also was she as completely organized in the sphere of industry.

The General Staff, in conjunction with the local general staffs in the Oversea Dominions, should undertake the work here suggested as one of its primary functions. The Imperial General Staff must be extended. In addition to a large number of Dominion staff officers attached to it, a body of experts must be joined to the General Staff, whose province it will be to keep in the closest touch with the industrial resources of the whole British Empire. These gentlemen must be in periodical consultation with the heads of great industrial enterprises, at home and oversea. Only by this means can England have an adequate system of co-ordination in being, instead of again, as in this conflict, taking a year or more to organize her resources after the war has been declared. It would, therefore, be a business-like move of great military value if in this connection there were created an advisory board under the direction of the Imperial General Staff, composed of expert business men in the United Kingdom and in the Oversea Dominions, whose creative power and business acumen should be utilized in obtaining ways and means for the assistance of the Imperial Government.

Each of the industries necessary to the government in time of war, such as railways, motor trucks, motor buses and other motor transport, aeroplanes, waterworks, wagons, horses, harness, small arms, heavy guns, armor plate, shells, cartridges, explosives, boots, blankets, meats, produce and hospital supplies should be represented on this committee. Certain military officers in the Ordnance and Army Service Corps would also be members. In time of war each civilian member of this Advisory Committee should be given a temporary commission in the Army or Navy, according to his particular province. This would confer upon each of them the necessary authority to enforce whatever instructions were given by the proper naval or military authorities. The members of the various trades and industries should be formed in groups, according to their particular businesses. Each group could thus supervise some particular branch of industry and could elect one member to this advisory committee. The War Office would then give out the plans and specifications of, for instance, the various classes of motor transport necessary for the army. Our motor industries would then know what to expect and could make arrangements accordingly. It would then be the business of the Motor Transport Group to inquire into and report to the War Office as to the building capacity of every motor factory in the United Kingdom or in the Dominions, the names of the manufacturers who would make samples under War Office specifications, and the delivery that could be had within say three months from each

manufactory on the samples given. The War Office should call for bids on its war requirements from every member of the Motor Transport Group for sufficient motors to transport the expeditionary forces and reserves. The War Office, on obtaining bids, should enter into contracts with the motor manufacturers for all the motor transport required. This should be repeated every six months. On the outbreak of war the War Office would then merely notify the manufacturers to begin on their contracts, and under these conditions the factories would be ready to start going on war work. This would prevent the confusion, delay and inordinate expense which in this war has had to be faced, owing to lack of preparation in time of peace. Of course, similar methods would be employed by the Imperial Government in respect of the other trades and industries which would be liable to furnish munitions and supplies in time of war.

The duties of the General Staff in the future must, therefore, become multifarious; its functions, from being purely military, must grasp matters legion; from military blankets to finance, it must have the necessary knowledge. Therefore it is imperative to have in the future such a General Staff as will possess a record of all the Empire's various resources, so that on the outbreak of another great war, a mobilization of industries can proceed as smoothly as that of the armies.

*Italy*

The government assumed control of most of the automobile factories, which were converted into factories for the manufacture of war materials.

*Russia*

Long after the opening of the war a commission was appointed to supervise everything related with the manufacture of munitions, advantage being taken of the plants then existing in the country. The commission was composed of the President of the Duma and of two high ranking army officers, specialists along these lines. Later, the jurisdiction of the commission was extended, being charged with the receipt of all military supplies acquired in the United States and in Japan.

*United States*

[Note. *Army & Navy Jour.*, Apr 8, '16. 200 words.]

The proposal to furnish munition factories with rifle and shell gauges so that they might be prepared for emergency orders from the government meets with approval from friends of preparedness. Twelve different gauges are required for shell manufacture alone. Some of these gauges are so delicate that after being used 1800 times they are worn so as to be no longer accurate.

[America's Industrial Organization for National Defense. By Thomas Robins. *Scientific American*, July 8, '16. 2500 words. Illus.]

In former times, the military strength of a country lay in the number and efficiency of

its soldiers. To-day it lies in the number and efficiency of its manufacturers. A modern soldier operating a 3-inch field gun can use up \$10,000 worth of shells in an hour, and a machine gun operating one-third of the time for five hours a day would require about a million dollars worth of cartridges per annum.

Warships and increases in the army would be useless without an industrial organization for the supply of matériel in unbelievable and unending quantities. In Washington it has always been believed that any reference to an adequate supply of munitions showed a friendly interest in the alleged "Munitions Trust"; and it was only when it was shown that an increase of this business for private manufacturers meant that a share would go to every section of the country that Congress was willing to take hold of it.

It is perfectly safe to say that, if the United States engages in a serious war, there would not be over ten per cent. of the factories of the country that would not be engaged in the munitions output. The life of the nation would require it; and if any producer refused his factory simply would be taken over by the government. All factories engaged in the construction of articles not needed for military purposes would be required immediately to suspend their manufacture of useless articles and turn their efforts to military usefulness. And it could be done in almost every case.

It is the purpose of the Committee on Industrial Preparedness: first, to learn who and where these manufacturers are; second, to decide what they could make in time of war; and, third, with the assistance of experts, to teach them now, in time of peace, how to make it.

A census is being taken, on confidential forms, of the names of the establishments, character of organization, address, and various details of the business. Great care is taken that secrecy is kept with the information furnished. Officers of the army and navy are detailed to classify the factories as to the particular military product they can supply in time of war. The general classification of the information is made by clerks who are sworn to secrecy. The general direction of the work is under men who understand "quantity production."

There will be furnished to manufacturers all the necessary specifications for the kinds of matériel they can best produce for the nation's defense. The plan is to give each manufacturer a small order each year, not as a commercial inducement, but to familiarize him with the articles he would be required to produce in time of war.

The production of these articles in quantity takes time. This fact will be patent if it is realized that, in spite of the large orders for rifles placed in this country by European powers, not a single one of these rifles has yet reached the front. It is generally supposed that enormous shipments of rifles have been made to Russia, but the fact is that all the Russian supplies from abroad have come from Japan.

The inventory has disclosed the startling

fact that, while this country can soon produce rifles and shells for artillery in sufficient quantities, there are only three firms that can supply the artillery itself; and up to date the entire output of rifle cartridges has been so small that it is merely used for target practice in Great Britain and Russia.

In the production of explosives we are dependent on Chilean nitrates, and the great increase in powder production actually means nothing in the matter of preparedness. Our security depends on what we could produce in war, not in peace.

We have learned that the annual consumption of supplies needed for the regular army and navy in peace will be sufficient to supply the educational orders just referred to; and that, instead of ordering all supplies in quantity from a few firms, by scattering the orders the educational features can be carried on, and if the time of necessity comes the manufacturers will be ready.

We possess one-half the industrial equipment of the world. When we have learned how to use it we shall certainly be so strong that we may not have to fight.

#### —Organization of Personnel

[National Defense—For Engineer and Contractor. By Major P. S. Bond, Corps of Engineers, U. S. A. *Engineering Record*, Mar 4, '16, *et seq.*]

(Part 9. Military Preparations of Engineers and Contractors in Time of Peace. 3500 words. 1 photo.)

For our national defense, the most useful form of patriotism is that which recognizes the military obligation of citizenship, and prepares voluntarily to meet it. Our civil engineers and contractors, with their technical training in construction, are the best material for engineer officers. In addition, the foreman and his gang, with their out-door training and discipline, are a valuable military asset. But the best civilian material has much to learn of the military duties, a portion of which knowledge must be imparted in times of peace.

The first step is to interest the profession in national defense. The greater problem of *maintaining* this interest necessitates some scheme of instruction which will furnish a driving force. To produce effective results, this should be directed by the War Department. At engineering colleges, courses in practical military engineering could be instituted, with the co-operation of the government, the course covering classroom work and field instruction.

The more difficult problem of reaching the practising engineers might be accomplished by an extension of the Plattsburg idea; it is a handicap of the volunteer system that the burden is thus unequally distributed. The greatest difficulty under this plan is that of securing systematic attendance. With the necessary Congressional action, with the co-operation of the trained officers and troops of the engineer battalions, this plan offers promise of success. The instruction would be along both technical and tactical lines, and, if distributed

**PREPAREDNESS FOR WAR—Continued**

over several encampments, would cover the various duties of the engineers.

The field training could be supplemented by a correspondence course of practical problems, and by a course of reading. Reading alone is of little value; it is experience and responsibility that develop judgment and power. But in the solution of practical problems, the mental faculties can be trained to analyze a given situation, to reach a definite decision, and to issue the orders to carry out a plan.

For students proficient under such training, commissions should be issued in the volunteer engineers. These might carry a small allowance from the government, to encourage and stimulate the interest of the voluntary workers. The above is merely a tentative outline of an educational scheme. Whatever policy may be adopted after a careful study, it will depend for its success upon the voluntary support of the civil engineers of America.

**PRESS CENSORSHIP**

[The Enemy Press. By Hilaire Belloc. *Land and Water*, 28 Sept., '16. 2000 words.]

The impression received after co-ordinating a considerable number of articles and pamphlets of the Teutons intended for home and neutral consumption, is that the chief element in their press at present is nervousness. By this term is meant a sort of unbalancing of the judgment produced by an overstrain upon the nerves: This is shown in the most astonishing sensitiveness to civilian suffering on account of the war within the Central Powers and in definite statements with regard to the military position which do not hang together and which are often foolish. Examples follow. *Frankfort Gazette*: "The feeling of impotence in face of the enemy's method of air reconnaissance is exasperating." *New Free Press*: of Vienna: "This is not war, it is extermination"; and again: "It seems as though the Allies acted from a lust for killing, one would say that the Anglo-French governments had determined to kill Germans at such and such a rate per month." From an official pronouncement quoted textually: "One of the offensive operations we have undertaken has been at work for now quite a long period. It is the attack against the French positions round Verdun. The course of this operation is methodic and implacable, undoing one after another each effort of the enemy to escape from the stranglehold which is crushing him. The slow disintegration of the French Army at this point proceeds with pitiless logic." (A calendar of the Somme offensive from July 1 to 31 is given. The writer states that this calendar is officially drawn up in Germany, published in various languages and distributed to the German public and to neutrals. He contrasts the statements made in it with the facts set forth in the French and English Calendars.) The following extracts taken from the German Calendar give a fair idea of the whole: "July 3d, All the Anglo-French attacks were repelled"; "July 13th, All the efforts of the

English and the French result in nothing but new checks and new disappointments"; "July 20th, On both sides of the Somme the Anglo-French forces attempt a decisive stroke and fail utterly, save for certain insignificant advantages"; "July 28th, Violent artillery duel on the Somme. Breakdown of strong English attacks." (The writer concludes that in view of the actual facts the German statements are so absurd that they can hardly be taken seriously.)

**Germany**

[The German Military Censorship. Editorial. *Army and Navy Gazette*, Jan 22, '16. 400 words.]

From debate in the Reichstag, it appears that in Germany municipal notices on the subject of food supplies are censored; that newspapers are suspended without explanation; and that certain acts in public are prohibited.

The Germans are accustomed to governmental orders, but they are beginning to complain of the censorship. It is stated that newspapers are threatened by private persons with an appeal to the censorship.

**PRISONERS (OF WAR)**

See also

EUROPEAN WAR—PRISONERS

**PROJECTILES**

See also

FIELD ARTILLERY—AMMUNITION  
TORPEDOES—AERIAL

—Smoke Tracing and Illuminating

See also

SEARCHLIGHTS

(Article: "Notes on the Employment of Searchlights and Illuminating Projectiles")

**PROPERTY RIGHTS (in War)**

[War: Against the Enemy or His Property? By Colonel Spohr. *Jahrbücher deutsche A. u. M.*, May, '15. 3200 words.]

The rule that private property must be respected governed the Prussian troops in 1866. In 1870-1 the same rule governed all German troops, the "barbarians" of to-day. The scrupulous manner in which this rule was observed by German troops often caused them inconvenience, if not suffering and diminution of effectiveness.

With Germany's record, it is interesting to compare the current behavior of her enemies—the ferocious course of plunder and destruction by the Russians, and also the practice of the troops of such "highly civilized" nations as England and France, whose conduct suggests that their object is the destruction of all means of existence.

The purpose of war is to compel the defeated belligerent to bow to the will of the conqueror. To accomplish this purpose, victory over the enemy troops, the armed forces of the enemy, is the best means. It is true that under certain circumstances the destruction of enemy property—dwellings, food supplies, etc.—may contribute to the desired end; but it is to be borne in mind that this is true only in



exceptional circumstances and cannot be regarded as a general rule. The question of the extent to which the destruction of property may properly be carried is, therefore, a matter that the responsible commander must carefully weigh.

A certain amount of destruction of property is inseparably connected with military operations, particularly in the attack of fortified towns. It is absurd that a residence, a church tower, or a cathedral used by the enemy as a point of observation or as cover for his artillery should not be destroyed. The reproach for such destruction rests not upon the destroyer, but upon the belligerent who first made use of the structure for military purposes.

An advancing force has also to consider the fact that if in the effort to take a particular place all means of shelter and all food supplies be destroyed, the occupation of the place after it has been taken will be made much more difficult.

The old method of taking a fortified place was to besiege it and by preventing the introduction of food compel surrender when the food supply of the garrison and population had been exhausted. The compulsion resulting from such a siege is not to be escaped, because ordinarily a fortified place is not in a position to produce new food supplies. This suggests the great difference between an ordinary siege and England's present attempt to starve Germany. Fortunately, however, Germany is still largely an agricultural state, accustomed normally to produce a large proportion of its own food supplies and able, under stress of circumstances, to meet all its needs, perhaps even without reliance upon supplies that may be obtained through neutral states which the enemy cannot control.

That the absolute prevention of the introduction of food and other necessities of life may succeed in bringing to terms an enemy state situated as is England is not to be doubted; but such a course would affect all other states of Europe, in fact, the whole world, because the necessities of life are by no means localized. The war thus far has proved that the destruction of food supplies and the interruption of the free interchange of the articles of peaceful commerce is bound to result in an enormous enhancement of the cost of necessities, to the detriment of both belligerents and neutrals.

On the whole, it would seem that as the Central Powers and Turkey have devoted themselves largely to agricultural pursuits and the production of the primary necessities of life, those Powers are economically better conditioned than is England herself to undergo the isolation that is the result of England's sea policy, and that in its indirect effects that policy is operating perhaps as much to the detriment of England as it is to the detriment of the Central Powers. However, as England is setting the example by strenuously endeavoring to prevent all articles of peaceful commerce from reaching the Central Powers, it would savor too much

of idealism if the latter were to forego the use of means that would serve to hamper England in her necessary efforts to supply food deficiencies by means of over-sea importations.

The economic conflict affects not only the enemy, but ourselves, our friends, neutrals, and the entire world, and really serves to delay the final decision, unless in addition to meeting the enemy upon his own ground in the economic struggle all possible force is directed against the hostile personnel.

## PROVING GROUNDS

See

ORDNANCE—PROVING GROUNDS

## QUARTERS

See

BARRACKS

## RADIO COMMUNICATION

See

WIRELESS TELEGRAPHY

## RAILROADS

France

[Railway Transport Arrangements in France. By Capt. R. Bonham-Smith. *Journal of the Royal United Service Institution*, Feb., '16. 9600 words.]

The conditions of modern warfare have made of much greater importance than ever before the existence of an adequate system of railways in the area affected.

Armies can no longer live on the country, due to the enormous number of troops involved. They no longer fight with only such weapons as can be carried by the men on their persons. The supplies for the men and the shells and cartridges for the big guns must be brought from the various bases, and for this work an adequate system of railways is essential.

It may be thought that with the development of road motor transport a new method of conveyance has appeared to replace rail transport, but it will be seen that such is not the case when it is realized that it would require about 150 motor trucks to transport the contents of one railway train.

A fact which has been brought into prominence in the war is the remarkably permanent nature of a railway. It has developed that the modern railway's complicated mechanism of signals, telegraphs and telephones, and electrical apparatus for regulating the movement of trains is not really an essential part of a railway, but that it consists, in its essence, solely of a roadbed and rails. This essential feature it is almost impossible to destroy.

The position of the British Transport Department in France is unique in the annals of military history, in that one of the combatants is entirely dependent upon the railways of an allied power for the transport of its men and munitions.

## Organization and Personnel of Railway Transport Department

The control of all rail transport arrangements for the Expeditionary Force is vested

**RAILROADS—Continued**

in the Director of Railway Transport, who is assisted by Deputy Directors. Assistant Directors are assigned to areas and Deputy Assistant Directors to important centers of traffic. Railway Transport Officers supervise entrainments at the various stations.

There is also a staff of clerks, checkers and railway police.

The personnel of the department is composed of officers with military experience and officers with railway experience, and the successful working of the system depends upon the judicious blending of these two elements.

**Military Control of French Railways**

The operations of all French railroads over which military traffic passes are controlled by a *Directeur des Chemins de Fer*. Under orders are the *Commissions de Réseau* and the *Commissions Régulatrices*. These commissions control all rail transport. The *Commissions Régulatrices* are in charge of the detail work and are represented at each station by their *Commissaire Militaire* and *Commissaire Technique*, the latter being the Station Master.

**Rolling Stock and Station Accommodation**

The majority of troop trains are made up of box cars for men and horses, and open cars for vehicles, with a first-class coach for officers.

No special platforms have been constructed to deal with British military traffic, so that the entrainment of troops must generally be effected from platforms intended for ordinary goods traffic. The presence of boxes and bales of commercial goods on these platforms very often hampers the work.

The loads of troop trains are heavier, and the speed lower than in England.

**Regulating Stations**

Regulating stations are those at which trains coming from various bases and depots are marshalled and reformed. For instance, cars coming from different bases, but all consigned to the same group of railheads, may here be formed into one train. These stations become of special importance when extensive troop movements are taking place at the front, since the officer in charge may there divert trains of reinforcements and supplies to such new destinations as the change in the military situation may require.

**Method of Dealing with Various Classes of Traffic**

(1) *Troops*.—When complete units are to be transported, it is previously determined by the British Railway Transport Department and the *Commission Régulatrice* how many trains can be furnished each day. The list of times at which these trains will start throughout the 24 hours is sent to the Railway Transport Officers and the railway officials, and the trains continue to leave at these times until all the personnel, horses, vehicles, guns and baggage of the unit have been sent forward.

The composition of the train is not based

upon the strength of the unit or part of a unit to be transported. The French specials are made up in what are called "type" trains and cannot be altered to suit requirements. The composition is as follows:

*Type Combatant* (called "Type C"): Thirty-four box cars, 13 open cars, 1 first-class coach, 2 brake vans.

*Type Parc* (called "Type P"): Twenty-four box cars, 23 open cars, 1 first-class coach, 2 brake vans.

The "Type C" is for infantry, cavalry and artillery; the "Type P" for ammunition columns, divisional trains, etc.

Drafts and reinforcements are sent to the front in specials if the numbers to be transported in any one day are considerable. On days when only small numbers are being sent forward, they are taken on the ordinary passenger trains to regulating stations or direct to railroad stations on the daily supply trains.

(2) *Supplies*.—The conveyance of supplies from the base to the front is effected by daily trains, each train conveying one day's supplies for two or more divisions. Fresh meat is loaded direct from the ship to special refrigerator cars. Bread comes direct from the field bakeries at the base. Provisions are loaded from supply sheds. Forage is furnished from a Central Forage Depot.

Formerly the quantities of each item of the supplies was regulated by the daily requisitions of the Supply Officer attached to each division, but experience has enabled the Supply Department to draw up a fixed scale of quantities, so that the composition of the daily supply for each division might be standardized. This standardized quantity is called a "type pack."

(3) *Ordnance and Stores*.—The method of transporting ordnance may not be described in detail. Stores are sent forward on the daily supply trains.

(4) *Postal Matter*.—Mails are transported partly by passenger train and partly by supply train.

(5) *Gifts and Parcels*.—Gifts sent by committees, firms or private persons for troops at the front, and not consigned to any individual soldier, are handled by Military Forwarding Officers. A daily return is furnished from the base to the Railway Transport Officer, stating how many carloads of gifts will be ready for shipment that day and for what destinations, and arrangements are made accordingly.

(6) *Returned Ordnance*.—Depots have been formed at certain bases to deal with the great quantities of damaged vehicles, arms and equipment sent back from the front. This material is carried back to the depots in supply trains returning from the front. After careful examination and classification, washing, disinfecting and repairing, a large portion of it is retained in the service and the rest condemned as useless.

(7) *Ambulance Trains*.—The rolling stock of these trains consists partly of special coaches built for the purpose in England and partly of ordinary French coaches converted into the component parts of an ambulance

train. At a central point in each area there is a Garage for Ambulance Trains, and these are drawn on as required. The requirements are communicated to the *Commission de Réseau* concerned, which issues the necessary instructions.

(8) *Horses to or from Remount Depots.*—Special Trains are arranged as required for the conveyance of horses and mules from Remount Depots to the front, from one depot to another, and from the front to Veterinary Depots.

(9) *Men on Leave, Stragglers, Prisoners, etc.*—The Railway Transport Officer is responsible for the forwarding to the proper destination of stragglers, prisoners of war, men on leave, etc.

#### *Time Tables for Special Trains*

A time table is prepared, which includes all the trains that it is possible to run over the system. The route followed by each is indicated by code letters. If it is required to run a special troop or ambulance train at a given time it is only necessary for the *Commission Régulatrice* to see which run is available at about the stated time and issue orders that "AX 25," for instance, will run that day.

#### *Forms and Documents*

The use of forms and documents has been reduced to a minimum. For any movement of troops or supplies, two documents alone are necessary. They are the "Movement Order," required by the Railway Transport Department, and the "*Ordre de transport*" which is required by the French railway staff.

#### *Personnel of French Railways*

The temperament of the French railway official requires that he be approached in a courteous manner, with full recognition of his position and authority. When so approached he is very obliging.

English railway officials, watching shunting operations in a French goods yard, would be apt to judge, from the great amount of shouting, gesticulating and argument, and the apparent lack of system, that trains would never be marshalled correctly nor leave on time. As a matter of fact, however, cars are placed for loading at the proper time, loaded trains leave punctually, and, if clear instructions are given, are correctly assembled. The expenditure of energy seems enormous, but the results are satisfactory.

#### *Russia*

[Petrograd-Arctic Ocean Railroad as a Factor in the Great War. By V. I. Perevel, *Voenny Sbornik*, Jan, '16. 1600 words and map.]

The construction of this railroad was commenced at the outbreak of the present European war, under the direction of General Brianchaninov. This road connects Central Russia at Petrograd with Kola, a port situated on the Ekaterinsk estuary of the Arctic ocean.

This railroad is not a new idea, it having been considered some ten or fifteen years ago, and having received the approval of the

highest authorities. In 1897-1898 a narrow gauge railroad was constructed from Vologda to Archangel, uniting this latter port to the Russian railway system. When the present war broke out, Archangel became the only port in Russia having sea communication with Europe, but as this port was closed by ice for about six months in each year, steps were at once taken to start construction on the new railroad to a new and more northern harbor at Ekaterinsk, close to the Norwegian frontier. This harbor, thanks to the Gulf stream, is never closed by ice.

As an opening to the open sea, Ekaterinsk had been surveyed by Russian engineers as long ago as 1899, and a town had actually been laid out and was known as Alexandrov, but as no steps had been taken to connect this town by rail with the rest of Russia, it developed but slowly and in 1910 had only 374 inhabitants.

The new railroad extends northwards from Petrograd, through the lake region to the shores of the White Sea, thence along the western shore to Kandalaksha, a small fishing settlement. From this point the line crosses the Moormanck peninsula to Kola, the terminus selected for the road.

Considerable engineering difficulties have been encountered during the construction of the road. Swamps, deep streams, wide lakes, dense forests and steep hills have all been met with, but it is expected that the railroad will be fully completed in the current year. The country through which the road passes abounds in much mineral wealth which it is hoped will be ultimately developed.

Great numbers of workmen have been employed in building this line, among whom were numerous prisoners of war. At date of writing it is hoped that the entire line will be opened for traffic in June, 1916.

#### *Serbia*

##### *See also*

SALONIKI-BELGRADE RAILROAD  
NISEH-CONSTANTINOPLE RAILROAD  
SERBIA—HISTORY

##### *—Armored Cars*

[Test of Armored Railway Car. *Army & Navy Jour.*, Oct 21, '16. 500 words.]

An armored railway car built for the U. S. army was tested at Sandy Hook Proving Grounds, Oct 18. The car mounts on its top a 3-inch field gun and has ports for twenty machine guns. The car was completed by the Standard Steel Car Co., Hammond, Indiana, in 27 days from receipt of order.

The car is a moving blockhouse intended for patrol work and not intended to resist artillery fire. The car may be entered by doors from either side and from both ends. A gondola car mounting a 4.7-inch howitzer is at Sandy Hook waiting to be tested.

[First American Armored Railroad Car Meets Test. *New York Times*, Oct 29, '16. One illustration. 1800 words (partly quoted).]

The first armored railroad car ever built for the United States government was tested

**RAILROADS—Continued**

recently at the Sandy Hook Proving Grounds. According to the reports, the test was satisfactory, and it is believed that Congress at its next session will be asked for an appropriation for the construction of several hundred of these cars, mounting ordnance varying in size and caliber from a twenty-six pound machine gun to howitzers and field guns.

Two armored cars are now ready at Sandy Hook. One mounts twenty Lewis machine guns, operated from ports in the sides and ends, while on a steel platform erected in the middle part, just above the ammunition room, is a three-inch field gun. The other car mounts a single 4.7-inch howitzer. No country has a better system of strategical railways than the United States, and in no other country is there greater need for an organized system of railroad defense.

The tests at Sandy Hook marked the first steps toward the solution of this problem. It has been estimated that on the Atlantic Coast alone there are more than 200 places where an enemy might effect a landing. Ninety per cent. of these places are unprotected by coast fortifications. But nearly every one is reached, or virtually reached, by a rail line, and those not in rail communication are close enough to connect with spurs in a short time.

Several months ago the Engineer Corps, which would be intrusted with the all-important railway problem in the event of war, decided to undertake the construction of an experimental armored car of the standard type, to weigh about forty tons and mount, in addition to the single three-inch field piece, as many machine guns as ports could be provided for. The engineer office in New York took the lead in designing this car, and it was built by the Standard Steel Car Company of Hammond, Ind.

Several weeks ago the car was shipped East. Unheralded, it traveled through four states, and one morning, not long ago, was sidetracked at Atlantic Highlands to be switched later to the little government railroad that runs between the proving grounds and the mainland.

At Sandy Hook the mounting of the ordnance began. It was decided to use Lewis machine guns and a three-inch field piece, a weapon similar to the famous 75-millimeter French gun. The weapon was constructed by the Ordnance Department, and a week ago the car was completed.

Brig. Gen. William M. Black, Chief of the Corps of Engineers, the board on duty in New York, which comprises Colonels Frederic V. Abbot, Harry Taylor, and Charles H. McKinstry, and Captain Thomas M. Robins of the Engineer Corps, who was largely responsible for the design of the car, witnessed the test.

The test involved firing at and from the car. Several thousand rounds were fired from the machine guns at targets on shore. These targets were supposed to represent an attacking force of infantry. Every now and

then the three-inch gun on top of the car joined in to aid the machine-gun men in demolishing the "attacking army." At the end of a few minutes the wooden targets had been destroyed.

The car was operated at various speeds. It also went into action while stationary. The guns were fired at various ranges—in many instances ranges had to be figured out rapidly, as would be the case in war—and the car proved its value every time.

The test involving the attack on the car itself also showed to its advantage, for the bullets from machine guns and rifles made little or no impression on the steel sides. Of course, no field guns were fired at the car, for it goes without saying that they could easily destroy it. The mission of the armored train is to destroy troops before such guns can be put into action.

As for the other car, which mounts the 4.7-inch howitzer, it is the product of the Ordnance Department, by which it was designed and built. It did not figure in the recent test, but if Congress makes possible the construction of any considerable number of armored cars it will be one of several units that will make up a complete fighting railway train.

An officer of the army familiar with the problem of providing suitable military railway equipment for the country was asked to tell what such a train would consist of, the number of officers and enlisted men needed to man it, in what sections of the country such trains would be needed most in the event of war, how long it would take to get them into action, what the cost of construction would be, where they would be kept in time of peace, and so on.

The American armored trains, he said, would probably be of several kinds. There would be, for instance, patrol trains of eight or ten cars, there would be trains of gondola or other platform-type cars mounting heavy ordnance, from the six- or seven-inch guns to those of the largest calibre. Likewise, there would be mixed trains, including cars mounting all kinds of guns.

A patrol train will probably be made up of eight or ten cars like the one just tested; this would give 160-180 machine guns, and perhaps eight or nine 3-inch field pieces. In addition, barrack and ammunition cars will be provided.

The operation of armored trains, under the plan of the War College Division of the General Staff, would be entrusted to the engineers. This plan calls for the organization of railway battalions and regiments, to be trained by engineer officers, and including railway officials and mechanics, such as conductors, brakemen, firemen, train dispatchers, signalmen, road builders, etc.

Some time ago, the War College Division prepared a map showing where this railway fighting force would be most needed. This map indicates by shading the areas in which are situated most of the armament and ammunition plants, and of the government depots and arsenals. It has been estimated that there

are perhaps fifty places along the New England and Long Island shores where an enemy might land to begin his campaign to capture these two vital sections of the United States.

One million dollars would build and equip 200 cars of the type tested at Sandy Hook, enough to make 20 trains. The trains mounting heavy guns would naturally cost more.

[Armored Car Planned and Built in Four Weeks. By George F. Paul. *Scientific American*, Sept 9, '16. 600 words. Illustrated.]

A special armored railroad car was built for the U. S. Engineer Corps in 27 days. It is a steel blockhouse on wheels. The weight is 86,200 lbs.; length, 47 ft; width, 9 ft. 1½ in. The center compartment has a special mount for a fieldpiece. The two end compartments are seven feet high and have 20 loop-holes. These can be closed by plates. The armor is proof against small arms. Two end and two side doors provide entrance.

#### —Construction and Repair in War

[Canadian Oversees Railway Corps. *Army & Navy Jour.*, Dec 25, '15. 400 words.]

At the request of the British War Office, a railway repair and construction force is being organized by the Canadian Pacific Railroad management. The force will be mobilized at St. Johns, N. B. The corps will consist of two companies of 252 men, each under a major who will be a superintendent of construction, one being a bridge engineer and the other a general foreman of repairs. The corps will be commanded by a lt.-col., with a chief engineer (major), a quartermaster (major), adjutant, paymaster, and medical officer (captains). Each company will consist of two platoons, each under a lieutenant, one platoon commander being assistant engineer and the other assistant to the adjutant. "The right platoon of each company will consist of a locomotive crane crew, blacksmith crew, telegraph crew, timber-trestle crew, bridge derrick-car crew, and three labor crews. The left platoon will consist of track pile-driver crew, track-laying machine crew, concrete-mixing crew, steam-shovel crew, work-train crew, and two labor crews. Each company will have a dining-car crew."

#### —Hospital Trains

See

SANITARY SERVICE—TRANSPORTATION OF SICK AND WOUNDED—HOSPITAL TRAINS

#### —In European War

See

EUROPEAN WAR—RAILROADS IN

#### —Military Control of

United States

[Railroad Aid for Defense. *Army and Navy Register*, Nov 27, '15. 1000 words.]

At a recent meeting of the New York Railroad Club was discussed the organization of a corps of railroad men as a branch of the Army Reserve, to work out plans for handling troops and material in the event of war.

General Leonard Wood, addressing the

meeting, said that a movement among railroad men to effect such an organization would undoubtedly meet with hearty co-operation from the War Department. He said that it would be foolish to place army officers in charge of the details of operating the railroads in time of war, but that it would be a good plan to use the railroad men to take charge of the work, with the co-operation of the military staff.

Mr. George D. Snyder, deputy chief engineer of the Hudson and Manhattan Railroad, pointed to the great advantage derived by the Germans from their realization of the value of the railroad in war. He said that at this time, when the question of defense was being discussed in the country, army officials and railroad men should get together for the solution of the railroad problem.

Mr. Snyder declared that there should be a railroad section of the General Staff of the Army, to be assisted by an advisory board of operating officials, engineers and contractors, including representatives of railway material supply houses.

#### —Strategic

[Note. *Army & Navy Jour.*, Nov 27, '15. 200 words.]

A report by Gen. French illustrates the value of a network of railroads behind a line held by an army. After the conclusion of the British offensive at Loos, the Germans in that vicinity were reinforced by 48 new battalions, including a division of the Prussian Guards. This reinforcement, considerably more than an army corps, enabled the Germans to deliver furious counter attacks which limited the success of the British offensive.

[International Railroads. By Major P. Charpin, General Staff. *Mem. del Ejército* (Chile), Aug, '16. 1500 words.]

International railroads are intimately connected with the economic development and with the military capacity of a country.

A study of early railroad building in Chile brings out the fact that in the construction of roads, the military features of the problem have been entirely neglected, economic considerations being the deciding factor.

Let us take up the network of railroads in Central Europe. To every Russian rail that touches the German frontier, there are linked one or more German roads. The same thing happens on the western frontier. Notwithstanding that France made every effort to keep in the lead in the matter of density of its network of railroads, Germany still forged ahead. The immense Russian superiority of numbers, immobile on account of the lack of railroad lines, has had to tolerate German selection of the point of attack, moving in any direction, while the numberless Russians, operating on interior lines, were unable to follow up the German movements, due to the lack of means of communication.

In dealing with the problem of national defense, economists are prone to consider only the natural or merely passive obstacles. They

**RAILROADS—Continued**

believe that money invested in the organization of national defense is a losing proposition because the returns are not in specie nor immediately forthcoming.

The effective defense of a country must be entrusted to the efficiency of the active elements which represent the army and the navy. National obstacles, fortresses and other passive means constitute only supporting points.

Once the building of a railroad line has been agreed upon, the problem of national defense requires the selection of the route giving the greatest assistance to the offensive and defensive action of the army—the one that is easiest to defend and to watch.

**—Track Gauges**

[Foreign Railway Gauges. *New York Times*, Oct 29, '16. 100 words.]

The railway gauges of the following countries are:

Russia, state and private railways—5 feet.

Rumania, state railways—1.26 meters.

Bulgaria, state railways—1.435 meters.

Greece, private railways—some lines 1 meter, others 1.44 meters.

Serbia, state railways—940 kilometers of 1.435 meters gauge, and 477 kilometers—76 meter. The 1.435 and 1.44 meters gauges are practically the same and correspond to our standard gauge of 4 feet 8½ inches.

**—Use of in European war**

[Speed in Moving Armies by Rail. Editorial. *Army & Navy Jour.*, Sept 16, '16. 500 words.]

The War Department is collecting statistics covering rail transportation of troops in the European War. The first British demand was for the movement of 350 trains of 30 coaches each to a given destination. The required time was 60 hours, actually accomplished in less than 48 hours. Thereafter 73 trains were moved every 14 hours in or out of Southampton. The British government pays the railroads their average net income before the war.

In France, between Aug 2 and 5, 1914, 3000 trains were run over the Paris-Lyons and Mediterranean Railways, and 1500 over the Orleans lines. Between Aug 5 and 19 (concentration), 4000 trains were run over the Eastern Railways alone, 395 trains being run on Aug 10. The Orleans road alone provided 2000 trains of 57,000 cars, which moved 600,000 men, 144,000 horses, and 40,000 carriages and guns. In the United States, it is figured that it would take 366 trains, comprising 2115 passenger coaches, 385 baggage cars, 1055 box cars, 1890 stock cars and 775 flat cars (total 6229 cars), to move a field army of three infantry divisions, one cavalry division, three regiments of artillery, and the necessary auxiliary troops. This amount of transportation is 0.7 per cent. of the locomotives and 0.2 per cent. of the freight and passenger cars in the United States. The maximum number of trains run over one road in a day by the French corresponds closely to that required for a field army.

**RAMPS, Loading**

[The T-W Gangway and Ramp. By Lt.-Col. L. M. Koehler, 8th Cavalry. *Jour. U. S. Cavalry Assn.*, Apr, '16. 250 words. Three cuts.]

(A description of a knock-down loading ramp for artillery, cavalry and vehicles of all kinds.)

**RANGE FINDING**

See also

ARTILLERY—FIRE—LONG RANGE

BALLISTICS

FIELD ARTILLERY—FIRE CONTROL

FIELD ARTILLERY—RANGE FINDING

INFANTRY—FIRE—RANGE FINDING

**—Instruments**

[A New Range-Finder and Slope Card. *The Canadian Military Gazette*, Sept 26, '16. 350 words.]

A very cheap and excellent range-finder has been perfected by Capt. C. R. Young, Canadian Army. The instrument is based on the principle that it is easier to judge the size of familiar objects in the landscape than it is to judge their distance from the observer. With a little practice it is easy to estimate the height of well-known objects, such as houses, trees, telegraph poles, etc. The height of men, cars, doors, horses, etc., is a matter of common knowledge. Given a dimension at right angles to the object, i. e., its height, the range is easily found. In using the instrument, the number of divisions of an edge-scale required to cover a known dimension of the target when the instrument is at arm's length is found, and without calculation the range corresponding to that scale-reading is taken directly from a table on the face of the instrument. On its reverse side is a slope card, to be used in determining the difference in elevation between any two points.

See also

ZEISS RANGE-FINDER

**RAPID FIRE GUNS**

See also

MACHINE GUNS

**RATIONS****United States**

[The Field Ration of the United States Army. By Colonel Nicolás Urcullu, Military Attaché. *La Guerra y su Preparación* (Madrid), July, '16. 3000 words.]

(The author describes the various kinds of ration, emergency, haversack, and field: the escort and the army wagons; trains, regimental and those of higher units.)

**—Emergency Ration**

[New Army Emergency Ration. *Army and Navy Register*. Feb 19, '16. 320 words.]

The food experts of the Department of Agriculture have advised the military authorities of the completion of a new recipe for an emergency ration. It is in the form of a cracker and is composed of flour and lean beef in equal quantities, with one-half as much dried milk. The nutritive qualities of the ration have been fully tested by the experts and pronounced satisfactory.

It was decided some time ago that the present emergency ration was not suitable and the War Department decided to abandon it and seek an improved article. Practical trial is now to be made of the ration above mentioned.

[Army Items. *Army & Navy Jour.*, May 20, '16. 150 words.]

The new emergency ration for the U. S. Army is in the form of a cracker, composed of flour and lean beef in equal quantities with one-half as much dried milk. A little "invert" sugar will be added, which it is expected will make the cracker less likely to crumble. This element also has restorative qualities. The nutritive qualities are satisfactory. The keeping qualities have yet to be tested.

### RECONNAISSANCE

[Notes on Scouting. By 2d Lieut. D. Campbell, Indian Army, R. of O. *Journal Royal United Serv. Inst.*, May, '16. 6500 words. Illus.]

(A collection of notes on the subject of scouting, gathered from the author's observations and deductions. A statement of general principles and a number of simple rules are given, together with a series of useful signs and marks to facilitate co-operation between parties. A table showing various methods of estimating distances is appended.—Ed.)

See also

AERONAUTICS—RECONNAISSANCE BY  
CAVALRY—SCOUTING AND RECONNAISSANCE  
MAPS AND MAPPING  
SKETCHING

### RECRUITING

See also

CANADA—ARMY (Article: The West's  
Awake)

GREAT BRITAIN—ARMY—RECRUITING

—Examination and Standards

See also

AGE LIMIT

#### Australia

[A Plea for Increased Efficiency in the Medical Examination of Recruits. By Major Walter Summons, M.D., 1st Australian Hospital, Cairo. *Australian Mil. Jour.*, Oct, '15. 2500 words.]

The first essential of an efficient army corps is rigid examination of recruits before and after enlistment. Experience with Australian troops has shown that great numbers of men were carried to Egypt, and even further, who were physically unfit, and whose unfitness should have been discovered at home stations. Thirty diseases are mentioned, the most important being apparently lung, heart and foot troubles, with a great deal of hernia and venereal disease. Mounted troops were found in many cases to be unfit for foot service and men specially enlisted were frequently incapacitated.

Some men, in their enthusiasm to enlist, concealed or made light of defects that afterwards disabled them. Others stood examinations by proxy. After the first excitement,

men frequently claimed exemption from drill, etc., on account of disabilities that were, in themselves, of little consequence; not that they were malingerers, but because their mental attitude was such that they magnified their troubles.

All men who go with an army into the field should be physically able to perform all classes of duty. While there is much work behind the lines that can be performed by those unfit for full duty, there will always be enough convalescents to fill the places.

Prior to the war, Australia was a most peaceful nation and the medical profession did not grasp the idea of the standard of physical perfection needed in a first-rate army. The orders of the medical services give explicit directions for the examination of recruits, but examiners are frequently either ignorant of the requirements or careless. Previous experience had been only in the examination of universal trainees, who were required to stand up for only 8 days' service, and many who could undergo this broke down quickly in active service.

It is not sufficient that an examiner be a medical practitioner; he must be trained and careful. Pay should not be based on the amount of work performed, and should be commensurate with the responsibility.

Disqualified men who are carried into the field are a great and useless burden to the army, and also a burden to the state. It is estimated that the average cost of such men to Australia, before they are finally disposed of, is not less than \$500.

### RED CROSS SOCIETY

[The American Red Cross. *Army & Navy Jour.*, May 20, '16. 200 words]

From Sept 7, 1915, to May 9, 1916, the Red Cross had shipped more than \$790,000 worth of supplies to the Allies, and more than \$248,000 worth to the Central Powers, and has one-twentieth of these amounts now ready for shipment. Serbia benefited most extensively with \$214,155 worth of supplies, and France next with \$192,405. Germany, England, and Russia each received supplies worth more than \$100,000.

See also

PREPAREDNESS FOR WAR—BY RED CROSS  
SOCIETY

### REFRIGERATION

[The Refrigerating Industry and the National Defense. By Dr. G. F. dos Santos, Captain, Medical Corps. *Boletim Mensal do Estado Maior do Exercito*, Jan, '16. 1500 words.]

While the conflagration in the old world is in progress, the question of national defense is being agitated and received with enthusiasm in the new world. The most important question is that of industrial preparedness.

Of all the great discoveries, none is of greater value to the people of the world than the discovery by Charles Tellier, called in France, "Le Père du Froid," of the application of cold to the preservation of foods. He presented the results of his investigations

**REFRIGERATION—Continued**

to the international congress which met in 1867.

The most important part of this discovery was in its application to the conservation of "green meats." The French, however, refused to take advantage of the discoveries of Tellier; but the English approved at once and proceeded to develop the industry, and other countries followed suit. The value of this new discovery is incalculable, but because of the opposition of the food dealers and merchants in France the government refused to allow refrigerated meats entry. Prohibitive taxes were levied upon articles shipped in cold storage, although the value of the discovery, by a Frenchman, had been demonstrated in every other important country in the world, and had solved one of the most difficult of economical and industrial problems. The fear of the French speculators that the introduction of refrigerated meats would lower the price of native meats was responsible for the attitude of the French government.

In feeding armed forces, the refrigerating industry has its greatest value not only in time of peace, but in time of war. In England and other countries the navies and armies have long been provided with frozen meats.

It is not difficult to imagine some of the difficulties of mobilizing an army and having to send fresh meat on the hoof to them, and something of this sort must have occurred in France at the beginning of the war, as well as supplying meats preserved by chemical means, much of it in bad condition. The killing and handling of the fresh meat necessary for an army cannot be done in the field in a sanitary way. In supplying two million rations, two thousand two hundred beeves are required, or twenty-two thousand sheep. It is easy to imagine the difficulties of driving these animals to the point where they are required and there slaughtering them, after which the meat must be delivered to the units requiring it.

In delivering frozen or refrigerated meat, one coach can carry 67 beeves or 697 sheep, which is the equivalent of 50,000 rations, more or less. The quantity which transported alive would require 240 coaches can be transported in 40 coaches if the meat is refrigerated.

In Germany, the most provident country in the world, the law requires that all meats to be consumed in the summer must be refrigerated. Enormous refrigerating plants were established at all important points for the use of the army. In 1910 the stock on hand at these depots amounted to 75 millions of kilos of meat, a quantity sufficient to feed the army during one year of war. It is not conceivable that the armies engaged in the present war could be rationed by any other means. To complete this admirable service of supplying meats to her troops, Germany formed trains of refrigerator trucks for distributing food supplies to troops in the field.

In France, for five years, J. Rennes, ex-inspector of the sanitary service of the Seine, has worked for the introduction of the refrig-

erating industry. In 1912, M. N. Lallie, in a work entitled "Le Froid Industriel," says that, "upon the nourishment given the soldier depends his endurance and vigor, and in view of the possibility of a continental war, practical means of establishing cold-storage plants in France should be worked out, solely with a view to national defense." This eloquent and impressive appeal was written two years before the war.

In the name of national defense, as well as for the protection of the health of the young blood upon which we must depend for the society of to-morrow, it behooves us to develop the artificial ice industry and refrigerating plants. Dr. Schmidt, the German professor, says, "It [refrigeration] is the best service rendered to society in the dominion of alimentary hygiene."

**REPAIR TRUCKS**

*See*

MOTOR TRANSPORT—REPAIR TRUCKS

**REPRISALS**

*See also*

EUROPEAN WAR—REPORTS OF ATROCITIES

**RESERVE**

*Great Britain*

*See*

GREAT BRITAIN—ARMY—RESERVE

*United States*

*See*

ENGINEERS—ORGANIZATION

UNITED STATES—ARMY—RESERVE

**RESPIRATORS**

[British and French Soldiers Wearing their Poison-Gas Masks. Reproduction of Photograph. *Sphere*, Nov 27, 15.]

The illustration shows a near view of the French and British masks. The British mask has two circular glass eye pieces, apparently set in the mask with a metal rim. It has also a mouthpiece through which the soldier breathes. The French mask has a strip of mica sewed in wide enough to cover both eyes. Both apparently cover the entire head down to the neck.

*See also*

ASPHYXIATING GASES—USE OF IN EUROPEAN WAR

**RETREAT**

*See also*

FIELD ARTILLERY—TACTICS—USE OF TO COVER RETREAT

**RIDING**

*See*

EQUITATION

**RIFLE**

*See*

INFANTRY—ARMS—RIFLE

INFANTRY—FIRE

ROSS RIFLE

**RIFLE SHOOTING**

*See*

INFANTRY—ARMS—RIFLE



## RIVER CROSSINGS

[The Crossing of Streams During Field Operations. By G. W-h. *Tidskrift i Fortifikation*, parts 1 and 2, '15. 9000 words and 4 illustrations.]

In order to be able to handle the bridge material and employ the available means for crossing streams during war time, engineer troops must have proper training in this work during peace maneuvers in conjunction with other troops. Four different conditions of bridging streams would naturally arise, but cases occur which involve two or more of these conditions.

(1) Laying a bridge *outside* the area of active military operations. Great stress is laid on the necessity for thorough reconnaissance of the ground beforehand by a sufficient force to prevent being checked by a small patrol of the enemy—and an examination of the further bank of the stream as well as the near to ascertain where there are passable approaches.

(2) Hasty passages over a stream *within* the area of active operations of the enemy. An illustration of this is given and it is shown that speed in execution is an essential requisite as well as secrecy and concealment in the movement of the troops concerned.

(3) Forcing a passage. An illustration of this is given. Usually a preponderating force of artillery is required for this and with favorable positions for the batteries on the near bank. The technical handling of the engineer troops in laying the bridges is given.

(4) Surprise passages. An illustration of this is given in the passage of the River Limmat, near Dietikon, Switzerland, by Masséna in 1799. Surprise passages may be executed either by passing around the principal forces of the enemy or by a frontal attack of the enemy's position on the opposite bank of the stream, in which case the choice lies between a passage by force and a surprise attack on the enemy's posts guarding the river bank.

Detailed descriptions follow of the (a) necessary investigations first to be made by means of reliable maps and reconnaissance as to *where* the passage of the stream is to be made, and (b) *how* it is to be executed, with an illustration.

See also

### BRIDGES, MILITARY

#### —In Argentine History

[Minor Operations of War in Argentine Military History. Passage of Water Courses. By Col. Garcia. *Revista Militar* (Argentina), July 9, '16. 16,500 words. 3 maps.]

The following events in the military history of Argentina are described and commented upon:

The passage of the River Paraná by the expedition under General Belgrano (1810-11).

The defense of the River Tacuary (1811).

The Battle of Caaguazú (1841). (This is of interest in that it describes how the Corrientes River was crossed in the presence of the enemy by swimming and by the use of improvised floats. The divisions (cavalry)

formed by squadrons on the bank. The men stripped, unsaddled and placed clothes, saddles, and equipment in small watertight boats called *pelotas*, which were made of hides. The troopers then mounted bareback and swam their horses across to the opposite bank, each man dragging his *pelota* after him by means of a rawhide thong.

The command crossed with the loss by drowning of only two men. The strength of the command and width of the stream are not given.)

The passage of the River Uruguay by the army under General Urquiza (1851).

#### —In Civil War (U. S.)

[An Historical Example of Forcing a River Crossing: The Federal Cavalry at the Pamunkey River, Va., May 27, 1864. By Capt. R. P. Howell, Jr. C. E. *Professional Memoirs*, Nov-Dec, '15. 2000 words. 2 maps.]

(This article first describes in detail the position of the Army of the Potomac on May 25, '64, split into three parts as it was by the North Anna; and outlines the provisions for assembling sufficient pontoon equipage to enable Grant to cross the Pamunkey near Hanover town and move around the Confederate right.)

After marching all during the afternoon and night of the 26th, with but one rest, these two canvas trains reached the Pamunkey about daylight, to find the opposite bank held by Confederate dismounted cavalry. Two boats were thereupon assembled under cover, and launched near the crossing-point. Under cover of the fire of a regiment of dismounted cavalry, these boats ferried over dismounted cavalry until a firing-line of some two squadrons was built up on the opposite side. The construction work then proceeded promptly, the first bridge, 180 ft. long, being completed in about an hour. A second bridge, 164 ft. long, was immediately constructed near the first. Another canvas bridge, of the extended internal type, was added the next morning, and when the wooden equipage arrived in the afternoon of the 28th, a fourth bridge was constructed. Over these four bridges the Army of the Potomac crossed quickly and safely.

This movement illustrated well the tactical principle, to-day more than ever true, that it is impracticable to construct a bridge with the enemy in undisturbed possession of the opposite bank. It demonstrates also the suitability of the canvas equipage for rapid movements; the two canvas bridges, released from service in the rear on the 26th, caught up and kept pace with the cavalry divisions in a way impracticable for the heavier wooden train.

#### —In European War

[Crossing the Danube: Work of German Pioneers. *Gazette de Hollande*, Nov 27, '15.]

A correspondent, describing the crossing of the Danube by the Austro-German army, writes to the *Nieuwe Rotterdamsche Courant*:

The task of the Teutonic technical troops in the Serbian offensive, more particularly the pioneers, exceeds in difficulty all that has gone before. The crossing of the Danube by two

**RIVER CROSSINGS—Continued**

complete divisions with artillery and railway columns had to be initiated and prepared by the pioneers, in such a manner that the enemy, who commanded both the Save and the Danube from the fortress of Kalimegdan, had no inkling of it. The whole pontoon flotilla was launched some 25 kilometers upstream, near Banowtse, there made into vessels, composed of three pontoons, which could carry 30 to 40 men, and then, masked by the bushes, dragged by the men to their destination in the tributary of the Danube, along the islands of Kashara and Huja. Rowing would have attracted attention. This, of course, was done by night, and every time the enemy's searchlights came in the direction of the flotilla the men stood quite still, or, if not covered by trees, dropped flat on the ground until darkness was restored. In the morning the flotilla reached its destination and the following evening the crossing began. In the deep iron and steel pontoons, the infantry was fairly safe against rifle and machine-gun fire. The pioneers, however, had to row and steer their craft across the rapid, broad river. In the first ships were the sappers, equipped with hand grenades, axes and other implements, calculated to clear all obstructions, so that the infantry could at once begin the attack. The Serbians had constructed their obstructions far into the Danube, connecting all trees along the banks, which at high-water mark stand in the river, with barbed wire, with the object of rendering a landing impossible. All these obstructions had to be cut down under an overwhelming rifle and machine-gun fire from the Serbs. Besides this, the pioneers had to stretch telephone cables across the Danube, which at this point is from 2 to 3 kilometers wide, vessels had to be constructed by joining several smaller vessels, strong enough to carry the heavy guns and railway stock, while the mines in the river had to be swept away. Self evidently, all this entailed serious loss of life.

After one division had taken Belgrade, the second was put across for the construction of the pontoon bridge across the Save, which is about 500 meters broad. This work was completed in half a day and was followed by a general sweeping of mines in both Danube and Save, with a view to shipping. Moreover, work on a second pontoon bridge was begun. This will be followed in its turn by the repairs to the iron railway bridge.

[Three River Crossings in the European War: Tactical-Technical Considerations. By O. F. Immanuel. *Kriegstechnische Zeitschrift*, Vol. 19, Nos. 1 and 2. Translated by Lieut. J. C. Gotwals, Corps of Engineers in *Professional Memoirs*, July-Aug., '16. 8800 words. Four maps.]

The forcing of a river that is held by the enemy, as Clausewitz points out in his classic, "On War," always presents a most difficult problem for a military leader, requiring moral and physical superiority. Napoleon considered as the greatest of all his achievements the

crossing of the Adda at Lodi in 1796, and the forcing of the Danube at the time of Wagram and Aspern in 1809. In more recent military history, the Danube crossing by the Russians in 1877, and the Japanese success at the Yalu in 1904, where they deceived the Russians and crossed where the stream was not guarded, have been looked upon as great achievements. Comparing these examples with the present war, we find that much is changed; but in spite of the valued technical improvements of our time, which benefit both attack and defense, victory is still won thru the skill and determination of the leader. Three stream crossings are considered of particular importance:

I.—*The crossing of the Army Group of Woysch over the Vistula, between Ivangorod and Warsaw, July 28-30, '15.*

After the capture of Lemberg in June, '15, the Austro-Germans decided on a general attack on the Polish "quadrangle," Warsaw-Ivangorod-Brest-Litovsk-Grodno. With the object of enveloping the Russian forces within this area, Mackensen advanced from the south northward between the Vistula and the Bug; Woysch and Prince Leopold of Bavaria moved from the west on Ivangorod and Warsaw; while Hindenburg's right wing was to attack the line of the Narew.

As the Russians decided not to abandon this area without an obstinate resistance, the forces advancing upon the fortresses of Ivangorod and Warsaw found their progress blocked and the capture of the forts a difficult task. The bold plan was accordingly conceived of crossing the Vistula between these two points, and thus breaking the Russian resistance. The river at this point averaged 2 meters in depth, from 500 to 1000 meters in width, with a stream-bed subject to deposits of silt which endangered the crossing of large boats and ferries. No permanent bridge existed in this reach. The Russians occupied the east bank in force, and the stream was well guarded.

The Landwehr corps of General von Koenig was assigned to this task, and preparations for the complete surprise of the Russians were undertaken. The locality chosen for the crossing, some 25 miles northwest from Ivangorod, was screened by cavalry on the north; from this region the inhabitants were concentrated and removed, and all lines of communication destroyed. By nightfall of July 27, preparations were completed for the crossing at ten different points, over a 9-mile front; the bridge trains, under the Austrian Colonel Mischek, had reached the river by detours, and both heavy and field artillery were stationed for effective use. It was a dark night; no lights were shown, and noises were avoided. The dispositions of the Russians were unknown, although weak patrols had been seen upon the opposite bank.

This "thrust in the dark" commenced at 1.30 a. m., when each party broke from its hiding-place, carried its pontoons to the shore, and embarked therein. Some Russian batteries which opened at 1.45 were soon silenced

by an overwhelming fire. No hitches occurred, and at 2.45 several German battalions had crossed and dug themselves in on the farther shore.

Despite their complete surprise, the Russians drew reinforcements from Warsaw and Ivanogrod, and a furious battle developed the following three days. With their superior artillery, however, the Germans were able to continue the crossing, by ferries and bridges, and captured 3300 Russians. On the 30th they stormed the heights of Podzamcze and thus assured the success of the crossing.

This bold and ingenious move had a far-reaching effect, for the Russians, considering it a serious threat, began at once to evacuate Warsaw and Ivanogrod, and to retreat to the east, thus surrendering a strong defensive line. The main credit for the achievement is due to the technical troops, the pioneers who, "under the greatest difficulties, again found occasion to illustrate their eminent capacity and self-sacrificing sense of duty" (official report).

II.—*The forcing of the fortified Narew line by the right wing of Hindenburg's army, July 18-Aug 10, '15.*

The Narew works formed the northwest front of the Polish fortress net, and provided a line from which the Russians could strike into East Prussia or behind which they could hold secure their communications with the interior of Russia. The river itself, being extremely swampy, is an important obstacle; and every favorable point of approach had been barred with barrier forts and supporting points. Lomza, Ostrolenka, Rozan, and Pultusk were the strong points that constituted the "outer line of the Narew," covering the 90-mile front from Wizna to Serock. The mean depth of the river is from 2 to 7 meters, but in the dry season it can be forded in many places.

In July, the difficult task of piercing this line was undertaken, with the object of reaching the important Warsaw-Vilna railroad, enveloping the Russian right flank, and of cutting off the forces near Novogeorgievsk. The Russian front at this time occupied a strong position in front of the Narew and some 12 miles deep, skillfully fortified by parapets of heavy trees and sand-bags, with several zones of barbed wire. A month of indecisive fighting had occurred before the armies of Gallwitz and Scholtz struck the Russian position on July 13 with the greatest impetuosity. Everywhere the Russians were defeated, losing in 3 days 50,000 men, of whom 21,000 were prisoners. By the 18th, German advance troops had reached the river, and the Russians were hastily withdrawing to the east bank. With undiminished speed, however, and great technical skill, the Germans, from the 19th to the 21st, fought their way across the river and won a secure position on the east bank. They had brought into effective range their heavy guns, and the 21 cm. mortars proved especially effective in supporting the pioneers and infantry.

In the face of this impetuous and splendidly

co-ordinated assault, Russian tactical and moral resistance was completely broken; great confusion and lack of leadership was the rule in their ranks. Well-planned counterattacks came too late, after the Germans had won the fortifications. The entire line of the Narew, from Ostrolenka down stream, had been won on the 23d by Gallwitz with the right wing. The army of Scholtz made somewhat slower progress, and it was on Aug 10 that the capture of Lomza completed the success of this wing.

Thus the famous barrier forts of the Narew, with some 32,000 prisoners, had fallen in an incredibly short time before German impetuosity, joined with technical and tactical skill. This victory contributed primarily to the gigantic successes that followed, the capture of Novogeorgievsk with 90,000 prisoners, and the general retreat of the Russian army. It proves that even a fortified river can be crossed by an adversary with superior strength who will use unhesitatingly and determinedly a favorable strategic situation.

III.—*The crossing of the Danube and Save by the army of Mackensen, Oct 6-11.*

In the fall of 1915, after Bulgaria had thrown in her lot with the Central Powers, the latter decided to strike a sudden and destructive blow at Serbia. With the co-operation of Bulgaria, it was planned to overrun the entire country before any of the Allies could send adequate aid, and to open direct communications with Turkey.

Thus arose the problem of crossing, in the shortest possible time, the short northern boundary of Serbia, which was strongly guarded by the natural obstacles of the Save and the Danube. The former river is everywhere 3 to 4 meters deep, 500 meters wide, and is bordered on the south by steep, commanding heights; there were no bridges in existence. The Danube is even more difficult. From Belgrade to Bazias it is some 1200 meters wide and 5 to 10 meters deep, bordered on the Serbian shore, like the Save, with dominating heights. Below Bazias, the river flows through a narrow, rocky defile in a succession of rapids known as the "Iron Gates"; in this reach the width is narrowed to 130 meters, the depth varying from 3 to 50 m.

Judging that the enemy would make their main attempt across the narrow stream near the Rumanian border, the Serbians had placed their 1st army, of 75,000 men, opposite this sector. From the narrows to Belgrade stood their 2d army, cut in two by the Morava River. The 3d army occupied Belgrade, observed the Save, and fronted west along the crossings of the Drina. With a total force in the field of 250,000 men on all points, the Serbians could not hope to occupy very strongly this boundary 275 miles in length.

The Teutonic leaders decided to deceive the enemy by assembling troops on the whole stretch, and to cross in numerous places simultaneously. Thus the Visegrad group was to cross over the middle Drina and envelop the Serbs from the west; the army of Koevess

**RIVER CROSSINGS—Continued**

was to break through at Belgrade and along the Save; to Gallwitz was assigned the sector farther east to Bazias; while the Orsova group was to demonstrate conspicuously near the Rumanian border in order to deceive the Serbians as to the main place of crossing.

The army of Gallwitz initiated the move on Oct 6. Preparations had been cautiously and quietly made, and a large amount of heavy artillery was available. The Serbian batteries opposite Bazias were overwhelmed after a three-hours' bombardment, and the troops were ferried over at this point under cover of this fire. Several battalions, with machine guns and mountain artillery, carried the heights of Goriza, 350 meters high, and won thereby a position that secured the crossing. The crossing of Temes Island was somewhat more difficult on account of a severe storm that threatened the rowboats, but it met with little resistance. The force that crossed at Semendria had the hardest task, and needed the support of its heavy artillery in beating down the desperate resistance of the Serbians. The crossing was complete on Oct 11.

The army of Koevess had to fight harder at Belgrade, where the Serbians had added to the ancient fortifications some modern batteries and entrenchments. The attack was based on the idea of subjecting the city and fortress to an enveloping artillery fire, thus driving the Serbian artillery away from the shore. The infantry then embarked in boats gathered in the Danube at Semlin, floated downstream, and all landed safely on the south shore—a bold and clever undertaking. That evening (Oct 8) Austrian troops penetrated the city, and by noon of the next day, after obstinate street battles, the conquerors' colors were flying over the city. The capture of Belgrade had a great moral effect, and was the signal for the general retirement of the Serbians to the mountains, and for the advance of the Bulgarians toward Nish (Oct 14).

The other crossings offered no difficulties, as the Serbians now fell back from the Save, and on Oct 22 gave up their resistance on the lower Danube, where the Orsova group, which had continued its feint, was enabled to unite with the Bulgarians.

This brilliant beginning of the Serbian campaign was due to the well-nigh perfect plans and preparations of Mackensen's army. The Serbians, despite their bravery and tenacity, were completely confused by their enemies' strategy and lost 8000 prisoners and 70 guns. Thus the old lesson was confirmed that the defender of a river line has a hopeless mission if the attacker succeeds in deluding him as to the place of crossing, obtains the tactical, technical, and moral superiority, and gains a strong foothold on the opposite shore.

**RIVERS****—Neutralization of**

[Notes on the Free Navigation of International Rivers. By Lieut.-Col. Francisco López Mojica. *Mem. Estado Mayor* (Colombia). May, '16. 2850 words.]

Inland navigable routes are, to a certain extent, more important than those of the sea.

The principal objection raised to the free navigation of rivers is that the sovereignty of a state is exercised over its territories, terrestrial and fluvial, the latter being included in the former. By reason of this sovereignty, the state, as the sole owner, may or may not authorize foreigners to utilize said territories as channels of communication.

The free navigation of the seas is a universally accepted principle. The same should apply to rivers, created by Nature for the benefit of humanity. Through International Congresses, constitutions, laws, decrees and public treaties, numerous states of Europe and of America have accepted the free navigation of rivers as an international doctrine, the only restrictions placed being those made necessary by police or sanitary regulations.

Therefore, Colombia has the right to utilize as waterways, and for commercial purposes, the rivers Zulia and Catatumbo, which flow across Colombia and Venezuela and have as an outlet the Maracaibo lake, which in turn is connected with the sea. The same applies to the Orinoco river.

Has Colombia exercised this right? No. Venezuela has prevented her from freely using the above mentioned rivers as channels of navigation, alleging that these rivers, on account of flowing through her borders, are exclusively national property.

**ROADS**

See

LINES OF COMMUNICATION

**ROADS, Military**

[National Defense—For Engineer and Contractor. By Major P. S. Bond, Corps of Engineers, U. S. A. *Engineering Record*, Part 5. Military Roads. Apr 1, '16. 4500 words. Four photos.]

With the increasing emphasis upon mobility in modern warfare, due to the development of the motor truck and to other factors, roads play more than ever an important part in military operations. Since military road-building differs little from civil practice, the civilian engineer needs only an appreciation of the economics of war in order to make his knowledge of roads applicable to military needs. The good roads demanded by motor transport, however, cannot be improvised after war commences; the United States is poorly equipped in this respect compared with many European countries.

The military road will usually be constructed to meet the exigency of the moment. It must be opened for traffic in the minimum time; but may be later altered and improved. Common labor will usually be plentiful, but little, if any, plant will be available. Although motor traffic will be utilized on good existing roads, recourse must often be had to horses and mules. For such slow-moving traffic, road improvement effects little benefit beyond a certain point; rough surfaces, poor alignment, steep grades (if the teams can be doubled)

are comparatively slight disadvantages under these circumstances.

Brick roads are out of the question, and macadam roads often unavailable. The common earth road will be the usual solution; it should be built with the proper mixture of sand and clay. Gravel can sometimes be used advantageously. In swampy ground, the "corduroy" or plank road will usually prove the best expedient.

Since military traffic moves in trains, an 8-ft. width of road may sometimes be made to meet requirements, passing points being placed at frequent intervals. A 16-ft. width is, however, desirable. Excessive cuts and fills should be avoided. Grades up to 10 per cent., or even more, are permissible; it is advisable to concentrate, in a few localities, the steeper grades, which can be later reduced. Thus ultimate requirements should be considered, as well as immediate needs. Questions of rights of way, etc., are non-existent, and first cost usually gives way to speed.

After the general location of the road is made on the map, a hasty reconnaissance should be made on the ground, for which very simple instruments will suffice. It is well to avoid timbered areas, if practicable. Skill in alignment will reduce the number of culverts required; when used, they should be of the simplest construction, plank and corrugated iron being suitable materials. A wooden trestle is often preferable to a more laborious earth embankment. In general, the road should follow the high ground or ridges.

Drainage, which has an important influence upon the bearing power of the road, should receive special attention. Ample side ditches should always be provided, preferably wide and shallow in cross-section. Retaining walls should be avoided, together with anything else that requires much time for construction.

For military roads, expensive maintenance is justified during the relatively short period required. Roads should be kept well shaped up, ruts filled, ditches kept open.

An important problem likely to confront the military engineer is that of determining the safe load of an existing bridge. Sometimes a mental comparison with similar bridges whose capacity is known will suffice. The competent engineer can devise for himself "rules of thumb" which simplify the tedious computations. [Here follow several such formulæ.] If any part of the bridge is deficient in strength for the load contemplated, reinforcement must be introduced in the shape of extra flooring, cross-braces, crib-work, etc. It is usually easier to bolster up an old bridge than to build a new one.

[Notes on Road Curves. By Colonel L. W. V. Kennon, Infantry. *Infantry Journal*, May, '16. 1500 words.]

An army wagon may be turned on a radius of 17 feet, allowing 2 feet for ditch, which also serves to keep hubs and single-trees away from the bank. Nineteen feet may be taken as the minimum radius of the inner edge of

a road intended for the use of army transportation.

Military roads should have a minimum width of 14 feet.

(Follows a deduction by mathematical formulæ of the location of road curves.)

In proper construction, curves should be level or the grade reduced below the maximum allowed for the road. Some power is lost at turns, even if the team is kept in line.

A satisfactory drainage ditch for mountain roads is 2 feet wide and 6 inches deep, of triangular cross-section.

## ROBURITE

See

EXPLOSIVES

## ROSS RIFLE

[Replacement of the Ross Rifle. *Arms and Explosives*, Sept 1, '16. 420 words.]

The official announcement that the Ross rifle has ceased to be the weapon of the later Canadian contingents does not come as a surprise to those who have looked into the question of the relative efficiency of the turn-bolt and straight-pull actions.

In rifles having a straight-pull action, of which the Ross is a prominent example, the bolt itself operates by a turning movement, as in other rifles. The handle has the straight-pull motion, the rotation of the bolt being effected by means of helical guides, and any considerable amount of undue friction renders this mechanism inoperative. With the turn-bolt, on the other hand, a great deal of power is available for starting the extraction of a sticking cartridge, due to the lever length of the bolt handle and the screw-thread effect given by the angle at which the lugs on the bolt are cut.

Apart from this distinction between the Ross and the Lee-Enfield rifles, the latter has several other points in its favor. Its shortness recommends it for use in the limited spaces available in trenches, and, further, the position of its bolt-handle makes possible a rate of magazine fire which no other military small-arm can equal. Far from being a perfect rifle in a mechanical sense, these two successes in design have made it the best weapon employed in the present war by any nation.

## ROUMANIA

See

RUMANIA

## RUMANIA

[Rumania's Attitude and Position. By "Politicus." *The Fortnightly Review*, Dec, '15. 5000 words.]

Rumania occupies an exceedingly important position, lying as it does not far from Constantinople and the narrows connecting the Black Sea with the Mediterranean. A great European power established at Constantinople can throw vast bodies of troops toward South Russia, Persia and India. Russia's interest therefore in this position is easy to understand, and is a well known matter of history: her land route to Con-

**RUMANIA—Continued**

stantinople lies through Rumania. To Russia, therefore, Rumania is strategically as important as Serbia is to Austria-Hungary. (The relations between Russia and Austria, with reference to Rumania are sketched, showing that it was Prussian policy to involve Russian and Austria in hostilities over Rumania, that this same policy was put forward by Talleyrand, and continued by Bismarck.) The reasons why Rumania does not wish to range herself on Austria's side are patent: she wishes to remain independent. Little as she wishes to be absorbed by Russia, as little does she wish to become an Austrian province. She knows perfectly well that the Dual Monarchy is founded not on freedom, but on persecution. She has ever before her eyes the example of the 3,500,000 Rumanians who live in Austria-Hungary in a modified form of slavery.

Rumania is to-day only a small nation because a portion only of her people live within her borders. The distribution is as follows:

Rumania .....	8,000,000
Austria-Hungary .....	3,500,000
Russia .....	1,500,000
Balkan Peninsula .....	900,000
	<hr/>
	13,900,000

Another point should be noticed as affecting Rumanian policy: The frontiers of the state are highly artificial. Sickle-like, Rumania has an enormous frontier line, and an invader, striking it in the middle could cut the country in two. But if the Rumanian territories now under the Austrian crown could be joined to the remainder of the country, Rumania would lose her sickle shape, become approximately round, and find her area doubled, without having lengthened her frontier line. Furthermore, the addition of Transylvania would form not merely an ethnographic and a national unit, but a geographic unit as well. It is surrounded by lofty mountain chains, only the southeastern portion of which is at present included in the Kingdom of Rumania. Could the whole of the area be acquired by Rumania, she would become nationally and geographically homogeneous, would have a defendable frontier, and would find her resources and wealth very greatly increased.

Naturally, all patriotic Rumanians desire to see their country rounded off, as indicated above, but equally naturally, the Magyars will resist this movement to the death. To the vast majority of thinking Rumanians it is obvious that the German-Austrian proposals to create a united Rumania enjoying self-government under the Hapsburgs are a delusion and a fraud.

The future therefore of this country depends on the issue of this war: it has everything to hope from the victory of the Entente Powers, and everything to fear from the triumph of the Central Empires. It consequently sympathizes with the former; and if she has not so far given voice to her sym-

pathies, the reason is perhaps to be found in their diplomatic shortsightedness.

To-day the Balkan situation is involved. Rumania finds herself in an unfavorable position, hemmed in as she is by Austrian, German and Bulgarian troops. Munitions she can receive only from Russia, and that country conceivably may have none to spare. Hence Rumania can not afford to strike unless assured of victory. Everything however should be done to convince her that the Allies are bound to win and that it is to her own interest to join in while there is yet time. It must be clear to all thinking Rumanians that they can win a greater country only by their own exertions. Before long the initial inferiority of the Entente in men, arms and munitions will be converted into an overwhelming superiority. Rumania should take the great step that will determine her future before it is too late.

*See also*

EUROPEAN WAR—GENERAL NOTES ON OPERATIONS BY THEATERS—EASTERN THEATER

**—Army**

[Rumania. *Information*, Sept. '16. 700 words.]

"The mobilization of Rumania brought over 600,000 men under arms; this force could be raised to a total of 900,000 with all reserves summoned to the colors. Rumania's strength may be summed up as follows:

**Army**

Military service compulsory and universal from the age of 19 to 42, capable of producing an army of over 600,000.

*First Line.*—Five army corps and two cavalry divisions, 220,000 men.

*Artillery.*—Twenty regiments of field artillery, each of six batteries of four guns each, four horse batteries, and nineteen fortress companies.

Seven engineer battalions and a railway battalion.

*Second Line.*—Thirty-six battalions and nine batteries equaling 30,000 men in time of peace, or 380,000 men in time of war.

**Equipment**

*Infantry.*—Mannlicher magazine rifle. Cavalry—Mannlicher carbine. Field artillery—450 rapid-fire Krupp, 75 millimeter guns, 150 field guns belonging to the reserve and an unknown number of heavy guns.

**Fortis**

At Galatz (junction of Danube and Sereth), three lines; at Nermolassa (Sereth), two lines; at Focasant, three lines, and around Bucharest, eighteen forts.

**RUSSIA****—Army**

[The Russian Forces. Letter to all the French, No. 7, published by a committee of Propaganda, at the end of Feb. '16. By A. Meillet. Accompanying *L'Illustration*. Translation in full.]

(Quoted as giving the French estimate of the Russian forces.—Ed.)

Like France, Russia, which was pacifically inclined, had not put forth all her energies with a view to war, for which Germany had been preparing for so many years. She must develop her means slowly. Her population is spread over an enormous area. Her railroad systems are insufficient and her industry is young; she was able to meet the Austro-German aggression with only a small part of her forces at first.

Moreover, at the moment when war was declared by Austria and Germany, she was reorganizing her forces, which had been demoralized by the unpopular war made on Japan. Industry was developing there with a rapidity quite American, and great business centers, like Moscow, were growing and being transformed from year to year. Having been struck at a critical point in her growth, Russia is little by little putting into operation the forces by the immense weight of which she will wear out her adversaries.

### *1.—Effective Strength in Men*

Russia had, in round numbers, 170 million inhabitants in 1913. Supposing like conditions of recruiting, she could then put into line more than four times as many men as France, whose population is less than 40 millions.

A Russian class comprises more than a million men and, as the birth-rate is incessantly increasing, each class is larger than the preceding one.

Of the men available each year, there were retained before the war, for the active service which lasted three years, only 435,000, not including the Cossack troops which are considered separately. The remainder were only partly trained or not trained at all. Behind the active army and the reservists mobilized at the beginning of the war, there was then a "militia" composed of men of the same age and, except as to training, of like military value. The militia, divided into two groups, first and second call, amounted to more than 10 million men, to wit, 22 classes of about 500,000 men each, from which must be deducted the annual loss. It is being mobilized in proportion to the needs: of the first line, they have called the classes 1916 to 1898, that is to say, men from 21 to 39; of the second line (comprising those exempted for different reasons), the classes 1916 to 1910. The military administration has made great demands, so as to train the recruits at its leisure and so as to be able to draw unstintingly on the depots.

The class of 1916 has been incorporated for some time, and the classes of 1917 and 1918 have been called. These three classes alone furnish about three million young soldiers.

The names of classes 1916, 1917, 1918 should not deceive the French reader. Russian conscription takes only developed young men. The class of 1916 is composed of men who were 21 years old or over on Jan. 1, 1916, and the class of 1918 of men who were over 19 on that same date.

In Russia they have never considered ex-

tending the age at which military service ceases to be a duty, which is 43 only.

At all points in the Russian empire recruits are being instructed; several millions of strong young men are drilling. Behind them, there are reserves that may be called.

The army of the first line has undergone heavy losses since the beginning of the war; even if we admitted that it had been entirely destroyed—which it evidently has not—Russia can replace it by a larger one.

Russia provides for the need of officers by schools to which she sends all her educated young men. For the infantry alone, there are twelve, each able to train more than 300 pupils. During the war, the course of study in them is four months. Every four months, then, Russia has more than 3000 new infantry subalterns.

### *II. War Matériel*

It was not for lack of men that the Russians lost the benefits of their successes of the autumn of 1914 and of the spring of 1915 in Galicia and East Prussia, and that they had to abandon Poland, Lithuania, and half of the Baltic provinces. They lacked cannon, machine-guns, rifles, ammunition. Artillery is the arm by which retreats are covered. Russia had only her bayonets to cover hers. The fact that this retreat, before an enemy much better-armed, lasted for months says a great deal for the courage and endurance of the Russian army.

As soon as the Russians were supplied again, the retreat stopped; the cities of Riga and Dvinsk, which have been attacked for months, are holding out.

Russian industry has at its disposal, in Russia itself, raw material at once excellent and abundant. Iron-ore, like that of Krivovirog, is of the first order. The basin of the Donets furnishes all the coal necessary to refine this ore. In normal times, Russia produces three and a half million tons of steel each year; that is more than is needed to furnish her with shells and cannon.

Unfortunately, the same mistake was made in Russia as in France; they forgot that they would not wage the whole war with supplies accumulated in peace time, and miners and metallurgists were mobilized with the other men of their respective classes. At once, industry was disorganized. It took long months to bring back production to the ante-war figure and to increase it. Miners and metallurgists were recalled from the front; they ceased to take recruits from among the qualified workmen of these trades; new workmen were sent for; some came even from China and Manchuria. Great progress has been made.

Of the numerous Russian ammunition factories, several, notably those of the Ural, have an obsolete equipment. But others, and especially the Poutilov factories in Petrograd, are modern and of great capacity.

In the month of Oct, 1915, the manufacture of shell was four times as great as it was in May. Therefore, beginning in Oct, Russian official reports speak of the activity of the

**RUSSIA—Continued**

artillery; when the Austro-Germans tried to re-enter Tchartorusk, they were overwhelmed by the Russian fire. On the ammunition boxes, the soldiers might read: "Do not economize."

The insufficiency of matériel had alarmed Russian public opinion; in the spring of 1915 industrial war committees were formed in all the provinces of the empire for the purpose of putting at the disposition of the armies everything which Russian industry can furnish, from little family workshops up to the most powerful factories. Prince Lvov, president of the Union of Zemstvos (provincial councils), said rightly: "All Russia must become a military organization," and his appeal was heard. The co-operative unions of the municipalities participated actively in the work. It was one of those great national movements characteristic of Russia. All classes of the nation were associated in it. Clothing, harness, wagons, hand-grenades, were produced in abundance.

However, Russian industry does not suffice in all respects. Russia has, then, looked for supplies outside, among the Allies and among the neutrals.

Russia is not blockaded as is commonly believed. Of course, she can receive nothing either by her frontiers in Europe, or by the Baltic, or by the Black Sea. But she has left on the north, the Arctic Ocean, along the shores of which navigation is possible all winter, and to the east of Siberia, the Pacific Ocean. Shipments arrive by these routes.

The narrow-gauge, single-track railroad connecting Archangel with the vicinity of Moscow has been improved. But the port of Archangel, on the White Sea, is blocked with ice during the winter. To have direct connection between the region of Petrograd and the Arctic Ocean, there is being built a double-track, standard-gauge line, work on which has begun only since hostilities began. This new line already has reached the White Sea; the work is being pushed actively and, in spite of winter, they are working on it still; when the last section is finished, towards spring, Russia will have access to a sea always open.

The port of Vladivostok, on the Pacific Ocean, is kept open by ice-breakers; and the trans-Siberian railroad, which was able to supply the Russian troops during the war with Japan, has been improved by the double-tracking as far as the Baikal. The port of Vladivostok which, during the first four months of 1914, had received 1100 "poods" of copper (the "pood" weighs 36 lbs.), received 269,000 during the first four months of 1915. If this port should freeze in spite of the precautions taken, cargoes would be unloaded at Port Arthur, which is connected with the trans-Siberian railroad. Nothing can then prevent Russia from receiving shipments from Japan, Canada, Australia and the United States.

Russia particularly lacks rifles. The manufacture of rifles is, as is well-known, one of

the most difficult to organize rapidly. Up to date the normal production of Russia has been only doubled. Foreign output will from now on make up for the principal insufficiency of national production.

Japan has put her factories at the disposition of Russia, in a large measure. There are a number of Japanese cannon in the Russian artillery. The factories of the United States and Canada have received large orders. France is making shipments. Finally, England, which has succeeded in transforming her powerful industries into war industries, has become able to furnish Russia with what she might lack in the equipment of six million Russians, according to Lord Kitchener.

**III. General Resources**

The connections with foreign ports are reserved almost exclusively for the passage of war matériel, and the population of Russia is obliged to live off the resources of the country. But, thanks to the extent of the empire and to the variety of its productions, thanks also to the simple life of most of the inhabitants, it seems that the population suffers from this condition of affairs less than might be feared.

Russia suffers more, perhaps, from the suspension of exports than from the stopping of importation. Unable to sell her oil and wheat outside, she no longer receives from foreign ports the usual payments, while she is paying out large sums for her purchase of war matériel. As a result came the depreciation of the rouble, which preceded that of the German mark.

But the resources of the country are so great that its financial situation cannot be otherwise than solid.

In spite of the sending abroad of several hundred million francs in gold, the metallic reserve of the Bank of Russia was 4,235,000,000 francs at the end of Sept, 1915, very sensibly superior then to the reserve of the German Imperial Bank, notwithstanding the hunt for gold made in Germany.

The elasticity of Russia is demonstrated by the fact that savings-bank deposits have increased a great deal, in spite of the state of war and the suspension of exports. Thanks to the suppression of the sale of alcohol, the Russian savings-banks, which received before the war 30 to 50 million roubles a year, now take in 50 million roubles a month. The single month of Oct, 1915, brought an increase of 73 million roubles; they had, at that time, 750 million roubles more than at the beginning of the war (the rouble is worth about 2.60 francs).

However, the wealth of Russia is not easily mobilizable. Although some local loans have been made, Russia will perhaps not be able to finance by herself all her share in the war; French capital, Japanese capital even, English capital will do what is necessary.

**IV. The Will to Conquer**

The Russian government is, from the nature of things, forced to have the will to conquer. If Germany should keep Poland,



and if she dominated the Balkans, Russia would be cut off from western Europe. So the commission on appropriations of the Imperial Duma, the Minister of Foreign Affairs, Mr. Sazonov, declared that rumors of peace negotiations were "devoid of sense," and this commission passed a motion to the effect that "Russia cannot think of peace as long as the German power is not broken. . . ." On the 2d Jan, this year, the Czar declared: "I shall not make peace until we shall have driven the last enemy from our territory." His order of the day to the troops for the New Year, 1916, stated: "There can be no peace without victory."

The Russian people, in fact, desire victory. The Russian peasant loves the land, and he does not consent that the Germans should occupy any part of it whatever. This war is a national war.

The enemies of Russia had hoped that a revolutionary movement would arrest her participation in the war. This hope is deceived. Although the government has made no concession to the Duma, the great majority of which, right and left both, have formed a national block, the revolutionary parties have understood that the success of German imperialism would be, for them, the worst possible check. Little groups of the extreme right—which is not in power—wish for peace, because they know that the checking of Germany will ruin their party; but no popular movement can start here.

Although the non-Russian nations incorporated in the empire have to suffer from Russian bureaucracy, they remain faithful to Russia, for they can expect no liberty from Germany. The Armenians have given enthusiastic volunteers to the armies of the Caucasus, and the Turks, allies of the Germans, have taken their revenge by massacring the Armenians of Turkey by hundreds of thousands. The bravery of the Lettov regiments has been reported in the Russian staff bulletins.

Russian soldiers are what they have always been, ready for any sacrifice. They are tenacious, they know how to suffer and die. They will suffer anything necessary to attain the victory which they desire. We had to promise them to push the war to the end.

#### —Army

See

BRUSILOFF, GEN. ALEXEI ALEXEIVITCH

#### —Army—Artillery

See

MACHINE GUNS—RUSSIA

#### —Army—Organization

[Along the Russian Front. By Edward Foord. *Sphere*, Dec 4, '15. 500 words. Illustrations.]

After their long retreat, the Russian armies are now in new positions on a shorter line. The armies are in large part reorganized, are nearer their bases, are steadily being reinforced, and the fatal deficiencies in munitions have been largely made up. It is reported that a serviceable railroad has been laid to

Ekaterina's Port, an ice-free port on the Arctic.

The Russian armies form three practically independent groups, under the control of the Czar, with General Alexiev as Chief of Staff. Alexiev is a soldier of sterling merit, and there is little fear that he will be unequal to the task.

The northern army group, before Riga and Dvina, is under Gen. Ruzski, the taker of Lemberg; the central group, from Lida to the Pinsk marsh, is under Gen. Everts, less well known than the other Russian commanders, but apparently holding his own with considerable success; the southern group, south of the Pinsk marsh, is under the command of Gen. Ivanov, one of whose subordinates is Gen. Brusilov, distinguished in the Carpathian drive in April.

#### —History

See also

CRIMEAN WAR

DARDANELLES

EUROPEAN WAR

RUMANIA—NATIONAL POLICY OF

RUSSO-JAPANESE WAR

#### —Military Topography of

See also

ARCHANGEL

EKATERINA HARBOR

#### —National Policy of

[Rumania's Policy. *The Spectator*, London, Sept 2, '16. Extract, quoted.]

"Rumania's aims are perfectly clear. She is now a country roughly equal in size to England and Wales, with a population of about eight millions—equal to that of Sweden and Norway combined. But there are probably five million Rumanians outside her borders. Over three millions live in Transylvania and in Eastern Hungary round Temesvar; half-a-million are to be found in Bukovina, which was an Austrian Crown-land. A million more live across the Pruth in Bessarabia. Rumania's ambition is to create a Greater Rumania, in which all these Rumanians may be included, thus doubling her area and increasing her population to thirteen millions. If Austria-Hungary had ruled her alien peoples fairly, Rumania might have been content to dream dreams. But the Magyars in particular have treated all their subject-peoples abominably, and have stirred up furious indignation in Rumanian hearts. There can be no lasting peace in Eastern Europe until the non-German and non-Magyar races in Austria-Hungary have secured decent government in accordance with their desires. Rumania states this plainly in the note declaring war, and the issue has now to be fought out once for all."

#### —History—Operations in Central Asia,

1847-48

[Military Operations in Central Asia. By A. V. *Voenny Sbornik*, May, '16. 2500 words.]

(An outline of Russian operations in Central Asia, in 1847-1848. The main Russian column was composed of about 2000 men of all arms,

**RUSSIA—Continued**

but most of the operations involved but smaller forces. There being no railroads in those days, camel transportation was largely employed, in caravans containing at times over 3000 animals. The resistance from the enemy does not appear to have been serious.)

[Military Operations in Central Asia. By A. S. H-Ky. *Voenny Sbornik*, June, '16. Continued. 5250 words.]

(This is the conclusion of an article on the campaigns in Central Asia, or Turkestan, during the period from 1848 to 1851. A rather detailed account of the strength of the Russian forces employed is given, with a chronological statement of events. A map of the theater of operations accompanies the article, and without this map it is difficult to follow the various phases of the campaigns which resulted in the permanent occupation of a large portion of Central Asia in the vicinity of the Aral Sea. The campaigns relate entirely to minor warfare in regions little known to readers in the United States, and is of but small value except for historical purposes.)

**—Military Conditions**

[The Expansion of Russia. By T. Miller Maguire, LL.D., F.R.Hist. Soc. *United Service Magazine*, Sept, '16. 1200 words.]

(Comment on Russia's growing strength.)

**—Railroads**

See

RAILROADS—RUSSIA

**RUSSO-JAPANESE WAR**

[A Visit to Manchurian Battlefields. By Major P. E. Pierce, 15th Inf. *Infantry Jour.*, Dec, '15. 4500 words.]

The party of officers from Tientsin who made this volunteer study was greatly indebted to the Japanese for their courtesy in the way of guides, ponies, etc. The Nanshan position was first visited, where the occupation of the walled city of Chinchow as an advanced position of the Russians was criticized. The town was beyond effective rifle range and the walls gave good cover from artillery. The occupation, involving a 35% loss to the garrison, delayed the Japanese only a few hours. It was a faulty choice. General Oku had no general reserve, which would seem at variance with accepted teachings. The Russian gun positions can still be seen on the sky line. No effort was made to conceal infantry trenches. The position is about 2½ miles long, with trenches not continuous, though at places there are three tiers. Only one regiment occupied this line, and the surprising resistance offered after their artillery was put out of action early in the fight was due in part to the excellent head cover, to the glacis-like slopes in front of a large part of the position, and to the sea on each flank. The left flank, however, was weak, as it was subject to enfilade fire from hostile gunboats. It was less strongly held and was also finally broken through at this point. General Fock, who held the Russian reserves inactive, is most

to blame for this defeat. An ideal defensive position lies two miles south, where the flanks of a position on the same peninsula would be secure against attack from the sea. This battlefield lends itself well to study, as it lies spread out in panorama before the observer.

At Port Arthur, we found recruits training on the battlefield and receiving descriptions of the battle. All forts here are in a good state of preservation, and actual visit gives the first clear conception of their magnitude. The training of recruits on the ground seems worthy of consideration. It is constantly the practice. A Japanese battalion was drilled in a combat exercise for us during the visit. We noticed three things especially,—the advance, even at close ranges, was made by the entire line, therefore without covering fire; the advances were made at top speed, and every effort made to lessen the time of exposure; bayonets were fixed individually at 200 yards.

When the charge was sounded, the defence left cover to meet the assault. The tactical soundness of this move is open to question.

This battalion had been in training only four months. We learned that the Japanese consider two years necessary to make the best infantry.

At Liaoyang the excellence of the British official reports was more than ever convincing. We were able to find even the emplacements of the field guns. The most striking lesson was the Russian occupancy of the long defensive line. An apparent gap of two miles was really one of the strongest parts of the position, due to skillful use of artillery and the skillful placing of the flanking forces on each side. Another faulty choice of an advanced post was noted. The occupying battalion was annihilated to no real purpose. The Japanese with greatly inferior forces held Manju Jama Hill, and showed conclusively that good infantry cannot be shot out of position. It is stated that one fresh Russian brigade on Sept 3, 1904, could have driven the exhausted Japanese into the river. At Hamatan, we remarked the tactical sacrifice of a company and the lesson thereof. Here also were illustrated the decisive results of a successful converging attack. To the rear of the Yalu, we noticed the faulty dispositions of the Russians to meet the threatened crossing of the river (i.e., dispersion and placing reserves on the right). Russian guns and trenches were not concealed. The difficulty of withdrawing field artillery when placed on the line of infantry was noted. Necessity exists for close communication, the Russian left having uncovered the center without sending word. Artillery is helpless when caught limbered up by effective fire.

The chief military interest at Mukden was the visit to the spot marking the desperate effort of the Japanese to break through the Russian lines, and to reach their line of communication.

Careful study must precede an actual visit. The British reports are best. Our own and

the German are good. Ian Hamilton, Nojine and Tretzakov are valuable aids. These battlefields should be visited between Apr 20 and May 20, or between Oct 1 and Nov 15.

The vital need of a historical section of our general staff was thoroughly illustrated by our experience, for we had to depend upon the accounts of foreign observers. This defect should be remedied. Great care should be exercised to render all proper honors, both official and social, for the Japanese officers are very courteous and punctilious.

England sends officers yearly to study these campaigns on the ground, showing her realization of the benefits to be gained. These details are sent at government expense, and it is strongly recommended that our own officers be encouraged to study and visit these battlefields. Eighty dollars for mileage and expenses on the boat leaves about \$8 of expense to the officer for a two weeks' study. A transport, by calling at Port Arthur, would enable a class of officers from the islands to reach the battlefields at a minimum of trouble and expense.

[Military Operations in Manchuria in 1904-1905. By P. Esmetev. *Voennv Sbornik*, Jan, '16. 3600 words.]

In the latter part of Dec, 1904, the Russian army in Manchuria had been directed from headquarters of the commander-in-chief to make necessary preparations to attack the Japanese Army by enveloping their left flank. According to these instructions the principal blow on the enemy's left was to be delivered by the following troops:

V corps,  
I Siberian corps,  
VIII, IX, and XVII corps,  
Provisional Rifle corps,

a total of 168 battalions, excluding the XVI corps which was to be a strategical reserve, all to attack the enemy's lines west of the railroad.

The general plan of operations was as follows:

I army (I, II, III, and IV Siberian corps and General Rennenkampf's detachment)—130 battalions to operate against the armies of Kuroki and Nodzu as a containing force:

II army (VIII, X, and I Siberian Provisional Rifle corps, and one brigade V Siberian)—139 battalions, together with the

III army (XVII, V Siberian and VI Siberian corps)—88 battalions, were given the mission of enveloping the left flank of Oku's forces. The estimated strength of the Japanese between the Sha-ho and the Hun-ho was understood by the Russians to be 22 battalions and 30 guns occupying a defensive position whose center lay about the villages of Sandepu and Lediatur. Especial stress was given in the instructions to the right wing on the importance of seizing the villages of Sandepu, Sentaitze, Shanitanken and Siduntia.

Were the Russian estimate of the Japanese strength on their left flank even approximately correct, certainly ample forces had been provided to lead to decisive results. But the

gathering of such large forces opposite their left may have indicated to the Japanese where the Russian attack was to be expected.

On Jan 2 news of the surrender of Port Arthur was received. This, however, did not change the intentions of the commander-in-chief to assume the offensive, but rather hastened preparations for doing so, in order that the proposed movements might be brought to a successful conclusion before there might be any possibility of the arrival on the theater of operations of the Japanese troops under General Nogi. It was thought that the latter might arrive towards the end of January. But it was thought best to await the arrival of the XVI corps, which was not yet up.

Although the proposed operations were entirely of an offensive nature, headquarters had ever since Dec 27 ordered the undertaking of various defensive works, some of which were quite extensive in character. These included the strengthening of the village of Sifantai, and an increase in the size of the Liao-ho detachment to 17 battalions, 42 squadrons and 58 guns. This force was given the mission of covering the right of the II army. These defensive measures had a bad effect on the morale of the army, and tended to reduce ideas of an offensive nature. They were in part induced by a belief that the enemy was reinforcing his left.

On Jan 12, 1916, the VIII corps was placed in a defensive position on a front of 15 miles on the line Sulobtai-Dakantaitze-Schantan-Sifantai, while the X corps was similarly placed on the line Sulobtai-Dachuanke-Iherpu-Tuelypu.

On Jan 10 the commander-in-chief issued a final direction for the proposed movements. As finally ordered these were to be:

1. Two corps of the II army were to attack Sandepu, and were to be supported by two additional corps in reserve.
2. The II army was to seize the line Futzia-chuanitza-Lediatur-Utziadantzi. The III army was to carry this movement on towards the west, at first by fire actions, and later by storming the line Kolantai-Chanlenpu-Siao-siandiantzi, with the V Siberian corps.
3. The XVII corps was to seize the line Lenshenpu-Lamatur.

The II army and the V Siberian corps, after having accomplished the mission assigned them above, were then to move successively in the order named to a new position towards their front. At the same time the VI Siberian and the I corps, in the order named, were to attack Koutkaisu.

4. In order to seize the line of the Sha-ho, the II army was to attack Tadusanpu with strong forces from the north and west.

5. Further instructions were to be given out later as circumstances required. The strategical reserve was to be composed of the 25th and 35th Inf. Divisions, the 6th Siberian rifle brigade and the 146th Infantry, to which was subsequently added the 41st Division.

This directive is of the same order as those of the Austrian General Melas. Nowhere is there any information concerning the enemy, nor any provisions for hostile movements.

**RUSSO-JAPANESE WAR—Continued**

Instructions are contained in this document as to details that should have been left to the corps commanders; for example orders as to moving the artillery up promptly to positions which it was hoped would be taken from the enemy. The three armies were ordered to take or occupy positions, but were in no place ordered to attack any hostile units. And there was apparently no idea that the enemy had any forces capable of assuming the offensive, outside of the forces of Nogi which were understood not yet to have arrived in the theater of operations.

The announced plan called for an initial attack on Sandepu, which was to be followed by an attack on Lidiatun, which, being in turn occupied, was to be followed by a further extension of the advance towards the south. One corps was to be detailed to watch towards the Sha-ho.

The VIII corps was ordered to make the attack on Sandepu, the X corps the attack on Lidiatun, which was to be supported by the fire action of the V corps. After Lidiatun was occupied, both the VIII and the V corps were to push forward. The III army was not to move forward until this time, but was to assist the action of the troops on its right by vigorous fire action. The Provisional Rifle and the V Siberian corps were to form the reserve.

(To be continued.)

**—Artillery in**

See

FIELD ARTILLERY—USE OF IN RUSSO-JAPANESE WAR

**RUSSO-TURKISH WAR**

See

CAVALRY—USE OF IN RUSSO-TURKISH WAR

**—Cavalry in**

See

CAVALRY—USE OF IN RUSSO-TURKISH WAR

**SABER**

See also

CAVALRY—ARMS—SABER

**SADDLES**

See

CAVALRY—EQUIPMENT—SADDLES

**Saloniki, Operations at**

[The Anglo-French Positions Around Saloniki. *Sphere*, Jan 22, '16. 400 words. 2 maps.]

The lines around Saloniki bear some resemblance to the Turkish position at Chatalja, but the valley is broader and the hills are higher. The Saloniki line extends in a wide semicircle from the Vardar River to the Gulf of Orphanos. The length is about 50 miles, nearly half of which is covered by Lakes Langaza and Beshik. The whole of this line is surrounded by a broad valley, marshy in some parts and offering little or no cover. The French occupy the west half and the British the east. To the north the ground rises slowly, and to the south a girdle of

hills guard the approaches to Saloniki, two passes affording sheltered communication. The hills command the valley in front of the position and furnish admirable artillery positions. The marshes of the Vardar give perfect protection to the left flank. About 10 miles from the mouth, where the French line leaves the river, the ground rises and commands the lower ground on the west bank. The swamps of the Vardar are malarial. The population of Saloniki numbers about 175,000.

**—Topography**

[History of the War. *Fortnightly Review*, Jan, '16. 4000 words. Two sketch maps.]

(Note.—From this article is taken only the description of the Saloniki position. This description is quoted practically in full.—Ed.)

The Saloniki position is well adapted to defense. The harbor is a good one, defended by shore batteries and mines, and safeguarded against submarine attack. The wharf accommodations are limited, but there is deep water near shore and these accommodations can be extended to any desired degree by temporary constructions.

Twelve miles west of Saloniki is the Vardar River, unfordable and with marshy banks. Eight miles north is a ridge of hills with Daud Baba as its central peak, about 1500 feet high. It throws off a succession of spurs to the river on the west and to the town on the south.

"Daud Baba has been likened unto Achi Baba of Dardanelles fame, and can be converted into a central citadel of the same kind, dominating as it does the railway approaches from the north, and forming the culminating point of a gigantic bridgehead, constructed so as to cover both the railway and road bridges over the Vardar. East of the Daud Baba position the hills turn southeast to the Derbend ridgeway, through a gap in which the high road is taken to Seres. South of this gap the hills rise again, and form a continuous range encircling the town, and bending gradually westwards to the Saloniki gulf. The average height of this range is from 1500 to 2000 feet, but at places such as Beas Tash (2193 feet) and Hortiach (3543 feet), the hills reach a higher elevation. From the mouth of the Vardar to where the hills touch the Gulf of Saloniki on its eastern shore the perimeter of this defensive line is approximately seventy-five miles, and if we allow 3000 men, including reserves, for every mile of defended ground, the garrison would be 225,000 men. The strength of the Allied forces at this moment is not known, but reinforcements of men and guns are arriving every day, and before the winter is over a mobile army half a million strong may be concentrated in the entrenched camp now under construction.

"The Saloniki position, as described above, presents almost insuperable difficulties to an attacking force whether coming from the west, or north, or east. On the west the topographical conditions are similar to those which baffled the Germans in their efforts to

capture Riga. On the north there is the Daud Baba position, which, if fortified after the manner of the defences on the western front, could not be stormed except at a prohibitive loss of life. On the east the town can only be approached by the twenty-mile gap between Lakes Butkovo and Tachinos, a section of the River Struma running along the whole length of this gap from lake to lake, and opposing an impassable barrier to the movement of troops till the river has been bridged. West of this gap, and within decisive artillery range of the Struma, are the forward slopes of the Krusha Balkans on the north of the Seres road, and of the Beshik Dag south of it. What with the lakes, the river, and the hills, the Struma position is a very strong one naturally, and, if fortified and defended with a sufficiently large force, would effectively close the entrance to Saloniki from this direction. Between the four lakes, Doiran, Langaza, Tachinos, and Butkovo, the country is rugged, wild, and roadless, save only for the one thoroughfare from Saloniki to Seres, and it was owing to the nature of this tract of country that the coast railway was taken by a wide detour from Saloniki to Doiran before turning east to Dedeagatch."

#### **SALONIKI-BELGRADE RAILROAD**

[The Saloniki-Belgrade Railway. By Crawford Price. *Sphere*, Nov 27, '15. 600 words. Map and illustrations.]

This railway follows the valleys of the Marana and Vardar rivers, crossing the divide north of Uskub. The railway is lightly laid, mostly single track, and incapable of sustaining heavy or high-speed trains. The line, however, has always been of considerable political importance.

Leaving Saloniki, the road follows closely the line of the Vardar River, crossing it three times in the lower reaches, the principal bridge being at Gumendje, near the Greek frontier. The route to Uskub is a constant climb. North of Uskub the divide is crossed, the road being flanked by high, wooded mountains. Toward Nish, the country is less broken, but not flat. From Stolzatz, a narrow-gauge railway leads westward to Ushitz. At Lapovo, another branch of the railway runs to Kragujevat, where the Serbian arsenal is located. From Lapovo, the railway leaves the Morava and winds in and out among hills and valleys, with much switchbacking up and down broken country. North of Ralia, a short distance from Belgrade, is one of the few tunnels on the road. Leading up to this tunnel, the grades are steep, and from this point the road drops down rapidly to the Danube. The train service is wretched. Except the journey from Saloniki to Constantinople, the journey from Saloniki to Belgrade is the worst in Europe.

#### **SALUTES AND SALUTING**

[The Military Salute. By P. Charpin. *Memorial del Ejército de Chile*, Aug, '15. 600 words.]

All armies lay great stress on the military salute. Some citizens think the salute un-

democratic. Some soldiers and non-com. officers try to avoid saluting. Some officers fail to return salute. Is the salute undemocratic? Has it an importance in the military relations? The same thing exists in society; saluting when a friend is met; respect of youth toward older persons. There are places where the farmer salutes the unknown traveler on the roads. Thus the salute is not undemocratic and does not imply any servitude whatever.

If the salute is necessary where mere friendship exists, how much more necessary is it where discipline exists. An army where the salute is not the measure of instruction, of interest, of respect of the members of the institution, where the officers do not return the salute, is an army which lacks discipline.

It is beautiful to see the frank, spontaneous salute of two comrades; the respectful salute of the new recruit; the one of deference which is given the old general by the ones new in the profession. The years of service of the sergeant, the stars of the officer and the shield of the general mark who must salute first.

There is nothing servile in the military salute. It is always the sign of companionship between equals, the sign of respect of the junior to the senior. By it the public recognizes the solidity of its members and the expert judges the spirit which animates the army on which the country has fastened its hopes of security.

#### **SANITARY SERVICE**

*See also*

ANIMAL PESTS IN WAR

EUROPEAN WAR—SANITARY SERVICE

EUROPEAN WAR—DISEASES IN

LATRINES—FIELD

UNITED STATES—ARMY—SANITARY SERVICE

#### *United States*

[Hospital Work on the Firing Line. *Popular Science Monthly*, Jan, '16. 500 words. Illustrated.]

(A popular description of the field equipment and duties of the Medical Corps, U. S. Army.)

[Deficiency of Sanitary Units of the Organized Militia. By Maj. L. T. Hess, Med. Corps, U. S. Army. *Military Surgeon*, Apr, '16. 2500 words.]

The tables of organization show that there should be fifty-seven field hospitals and fifty-seven ambulance companies in the four field armies proposed for the Organized Militia under the present scheme of division districts. There are at present twenty-nine field hospitals and nineteen ambulance companies. Of the sixteen divisions, only one is complete in its sanitary units.

The minimum requirement in the personnel of a field hospital is five officers and thirty-three enlisted men; of an ambulance company five officers and forty-three enlisted men. The War Department will extend every possible assistance in the organization of the additional sanitary units required.

**SANITARY SERVICE—Continued****—Dental Personnel and Service***See also***DENTISTRY, MILITARY****—Equipment**

[Proposed Equipment for the Hospital Corps Soldier. By Maj. R. B. Miller, Med. Corps, U. S. Army. *Military Surgeon*, Apr, '16. 3200 words. Seven illus.]

A board of Medical Officers was appointed in 1913 to consider the question of the equipment of the Hospital Corps soldier. The board continued its labors for about two years, during which time there were a number of changes in its personnel.

If either the cavalry or infantry equipment were adopted—and the cavalry equipment was recommended as most suitable—then all items of H. C. equipment except the pouch and its contents and the H. C. knife would be rendered obsolete.

The first decision of the board was to recommend a belt instead of the pouch. By certain changes, as good an equipment could be carried in the belt as in the pouch. The infantry hand axe, Mod. 1910, was adopted in place of the H. C. knife (bolo), being lighter, available also as a hammer, cheaper, and more easily sharpened. The hand axe being also an article of issue to other troops, a large reserve supply is avoided.

In the opinion of the board, the proposed equipment has the following advantages: More comfortable, lighter, weight better distributed, no constricting straps across the chest, nothing flapping about the legs, more durable, and more military in appearance. The cost will depend upon the number manufactured. The belt will cost more than the H. C. pouch, and the hand axe will cost much less than the H. C. knife.

**—Establishments—Hospitals***See***HOSPITALS****—First Aid Tag**

[An Endeavor to Improve Upon the First Aid Tag now in Use in the United States Army. By Captain H. H. Smith, Medical Corps, Nebraska National Guard, 1st Lt., Med. Reserve Corps, U. S. Army. *Military Surgeon*, Nov, '15. 1000 words. Illustrated.]

Proposes a new card, to be punched in duplicate. It is to go with the soldier. The duplicate parts are removed by the medical officer punching it, these parts removed to give the history, when and where wounded.

**—In Army and Navy Joint Operations**

[The Army and Navy Medical Departments in Joint Campaign. By Surgeon D. N. Carpenter, U. S. Navy. *Military Surgeon*, Apr, '16. 4500 words.]

(In the author's own words.)

To summarize, therefore, this discussion of the question of co-operation of the Army and Navy Medical Departments:

History demonstrates the necessity of co-operation of the Army and Navy during war if victory is to be assured.

There must be co-ordination of authority and complete harmony to secure the best co-operation.

The differences in organization, administration, equipment, and training between the Army and Navy Medical Departments are not irreconcilable and can be readily co-ordinated.

The greatest difficulties to overcome are the questions of land transportation, ambulance companies, mobile field hospitals and field supply depots, all of which the Army should provide, as the temporary service in the field of the Naval Medical Department does not warrant the maintenance of such permanent units.

It is advisable to retain the separate organization of the Army and Navy Medical Departments when co-operating. The Marines by law can serve with the Army and are subject to their regulations. This is not so for the Navy. The differences in clerical records can be co-ordinated, and the Chief Surgeon can administer the Medical Department of a Naval or Marine expeditionary force through the Brigade Surgeon or directly to each Regimental Surgeon.

[Combination of the Medical Departments of the Army and Navy in Campaign. By Col. H. P. Birmingham, Med. Corps, U. S. Army. *Military Surgeon*, Apr, '16. 1500 words.]

The command of combined forces of the Army, Marine Corps, Organized Militia and volunteers, is governed by the Articles of War. In large forces where any or all of these were combined with forces of the U. S. Navy, the commander of the whole would presumably be appointed by the President, hence no question of command.

When the Marines serve with the Army, one question to arise concerns the status of the naval medical officers assigned to duty as medical officers of the Marine units. The question caused no difficulty. The Marines had a separate field hospital and their sick were kept separate, a step necessary to prevent confusion in returns and records. Otherwise the amalgamation was practically complete. Medical and sanitary supplies were drawn from the Army. Requisitions and receipts were accompanied by two certificates, one from the issuing and the other from the receiving officer. These certificates formed the basis of a settlement in Washington by a transfer between appropriations.

Thorough co-ordination of the Medical Departments may readily be brought about without difficulty. Standardization of equipment and supplies for the two services, particularly of those items intended for field service, would aid in such co-ordination.

**—In European War***See***EUROPEAN WAR—SANITARY SERVICE IN****—Instruction and Training**

[School of Military Sanitation. By Lt. Col. P. I. Acuña, Surgeon of Division. *Rev. del Circulo Militar*, Sept, '15. 2500 words.]

(Discusses the local needs in regard to the education and training of military surgeons,

with suggestions as to means for meeting them.)

#### —Instruction and Training—Militia

[On the Instruction of the Enlisted Sanitary Personnel of the Organized Militia. By Charles W. Comfort, Jr., 1st Lieut. Med. Corps, Connecticut National Guard. *Military Surgeon*, May, '16. 3200 words.]

The difficulties of training a militia sanitary organization are due to armory conditions, type of personnel, lack of time and system, and monotony.

It is proposed to overcome the two latter by the author's plan, which contemplates one and a half hour's instruction and drill once a week from Nov 1 to June 30.

Five minutes are allowed for assembly and roll call. Drill should be short—not over twenty minutes; as varied as possible, and snappy. This amount of time will give, in the course of the winter, time enough to teach all necessary movements.

A lecture, in plainest language, not over half an hour long, should follow, in which anatomy, physiology and first aid should be taught by the regional method. The last half hour should be devoted to practical work in first aid, splinting and bandaging, done by the men themselves, in which their interest should be sustained by competition between squads.

The lecture course comprises eighteen lectures, on general anatomy and physiology, first aid, head and neck, chest, upper extremity, lower extremity, abdomen and pelvis, alimentary system, excretory system, special senses, emergencies, hygiene, care and use of material, nursing, and regulations.

Thirty-two drill periods are provided for, during the year, of which one is used for the annual inspection, and six for review and preparation for camp.

Practical instruction in tent drill and in making and striking camp are particularly valuable.

The men should be graded and marked as an incentive to work, and also to indicate the men fitted for promotion.

#### —Medical Supplies

See also

MOSS—USE OF IN SURGICAL DRESSINGS

#### —Transportation of Sick and Wounded

[With the Wounded in Egypt. *Sphere*, Nov 13, '15. 1600 words. Many illustrations.]

(Describes generally the hospital ships plying between the Gallipoli theater and Alexandria; the arrangements for unloading and transporting the wounded upon arrival; the elaborate provisions necessary for handling the wounded after landing. All resources were strained to the utmost when the Gallipoli operations began. Now order has emerged, and there is an organized series of hospitals, convalescent homes and health camps.)

[Lecture on War Administration, Transportation and Care of Sick. By First Lieut. A. F. Hulkrantz. *Krigsvetenskaps Akademiens Tidskrift* (Sweden), 1st and 2d No., Jan. '16.—To be continued.]

Outlines of the lessons from the World's War have as yet been dimly contoured. It is not only vital that the Army and Navy be fully prepared, but also the Administration for finances and the necessities of life be equally carefully prepared. Credit and money exchange must be well taken care of beforehand, and this part is even true for neutral nations during wars. The best military organizations and strategies fail if these are not provided for. Now a nation's financial and material preparedness have an importance that formerly could not have even been estimated. Military administration is at present, more than ever, apparent as only a part of the country's great household.

For other nations as well as for ourselves, much actual work has been done and more outlined in subjects that heretofore have only been subjects of discussion, such as at the beginning of this war, a whole system of more or less provisional ordinances governing credit systems, foreign bank exchange, maritime insurance, export embargoes, etc., just to meet the new situations created by the war. There has been introduced before our Riksdag a bill to appoint a commission, consisting of persons equally expert in their various departments as those in the War Ministry, to draw up plans for the safeguard of the nation's economic preparedness. Unfortunately, the bill failed. However, its provisions must now be otherwise obtained.

The first question to be considered is the requisite for free passage of grain and the other necessities of life, storage and distribution of same and maintenance of an adequate reserve supply. In Germany and Austria, government supervision has been enforced. Proper laws have been passed to diminish the unnecessarily large normal consumption of grain by means of 200-gram (Germany) and 210-gram (Austria) breadtickets; also forbidding the selling and serving of meats and fats on certain week days; besides many other similar ordinances. The results have been astonishing besides proving that it is impracticable to starve out these countries. They have attained their goal partly through these ordinances, partly through requisite means, partly through the creation of entirely new substitutions for certain kinds of provisions. German and Austrian technical publications are full of directions and rules for obtaining maximum value out of all foodstuffs and of land cultivation.

In our own Army experiments are being carried on with bread containing a certain per cent. of arrow root or potato starch. Importing from America large supplies of grain and provisions, adds to the difficulties of storing and reissuing. Of special importance is the organization of the domestic industries so that, in time of war, harmonious work between supplying the needs of both Army and civilian population with actual necessities can be carried on. The government should control this besides raw material, such as metals, chemicals, wool, cotton, hides, gums,

**SANITARY SERVICE—Continued**

rubber, etc., and see that enough is accumulated within the country in times of peace.

In Germany elaborate plans for this are in effect. The Prussian War Ministry, at the outbreak of war, established a separate branch (Kriegsrohstoffabteilung) that prevented use of and conserved all raw war material as metal, chemicals, textiles, etc., so that no shortage would take place. Immediate inventory was taken of states, communities and individuals and was even extended to captured territory. Timely requisitions were made on these supplies both for the government and for private manufacturing plants. Under the war ministry's control and co-operation, companies (Kriegsrohstoffaktiengesellschaft) were formed to receive the goods at the specified requisition price and distribute them to the different consumers as needed. Besides specially designated firms had to attempt to import, if possible, like supplies; to superintend; to act as middlemen between the War Ministry and the consumers. Fixed maximum prices prevents unsound speculations. This newly established branch in the War Ministry rules this whole undertaking (the largest business enterprise in the world), and is also engaged in finding substitutions for certain raw war materials together with giving directions for their manufacture and use, with the view of conserving the materials especially essential for war purposes. Through its efforts, great advances have been made in sciences. Use is being made of the imported textile materials. In Germany the manufacturing industries have voluntarily turned to produce all things made necessary by the great demands of the war. Within the territorial limits of each Army Corps, its commissary has sufficient jurisdiction (Korpsbekleidungsamt) for equipping troops, creating a central place for manufacture of all articles of uniforms. Enlargements of plants have naturally taken place and the personnel increased many fold by calling upon the older class of "Ekonomiehandwerker" besides using extra male and female labor; also the number of localities have been increased by renting suitable building so that over 40 such plants have been established during the war. Certain private firms are likewise engaged. Strict inspections are made by officers belonging to this important staff, are made so that no chance is taken to have the articles rejected when delivered to the theater of war.

Many changes have been made both as to the uniform models and the materials therein, as the war progresses, in the latter especially on account of savings that must necessarily be made due to the war. For instance, the well known German helmet is made of thick hard-pressed felt; waist belts, cartridge belts and all other accessory straps are made of canvas. Austria is using cotton for the uniforms and a cloth resembling our moleskin cloth, has been evolved, thus saving their wool. Similarly all mess outfits, field kitchen utensils, etc., are made of pressed

steel plate instead of aluminum, copper, etc., as formerly. It is appropriate to remark here that the back-pack is gaining favor among all troops engaged, as the method of carrying the infantry equipment is slowly crowding out the traditional knapsack. The question of the relative value of these two ought to be settled without a doubt in this war with the soldiers fighting side by side equipped with these two different forms.

Experience has shown that the only head dress for actual field service is the metal helmet. The question has been a subject of special study in France because of the great number of head wounds; 13.3% of the wounds have been head wounds and out of these 57% have been fatal. In consequence the head gear of soft material has been discarded and a cup-shaped helmet adopted. The English army in France has had similar experience: 76% of those who had wounds in head wore soft hats, 24% helmets and of the latter 60% suffered only severe shocks or trifling wounds and bruises. So likewise they have begun to equip their troops with metal helmets. The Germans are well satisfied with their helmets, even though a small part of it is metal. We should draw the lesson from this experience and equip our troops with helmets, for we can rest assured that, since the English and French did not adopt it from the beginning but only finally because they were driven to it, is evidence enough for the necessity of helmets.

The proportionately large loss among officers during the first half of the year, shows that conspicuous dress and mark of rank, such as highly polished boots, glass cases, field cases, insignia, uniforms, etc. make them targets for especially well directed fire. It is known, that in the Russian army 20 men in each company, composed of the best shots, are designated, in spite of any orders of the company commander, to solely direct their fire on any visible German officers. Consequently uniforms have been changed and in both the Russian and German armies the officers have discarded the useless saber and have armed themselves with the infantry rifle. Our uniform No. 10 should be altered with reference to the conspicuous officers' insignia; it shows its character now more than ever as a practical field service uniform. Attention is called to the fact, that the French were compelled to changed from the well known blue and red to the new blue gray one, even though it was hard for the proud French to put aside their traditions.

A question that particularly concerns our army is that of foot-gear for field service, although this has not been pointedly brought out by the war. The Germans are content with their boots and their marchings for great distances from victory to victory proved their worth; the Austrians maintain that their high top lace shoe is the only shoe for rough and hilly country. It however is apparent that each nation considers that shoe best for its troops in which they have received their training in marching.



The importance of the travelling field kitchen (cook-wagon) has been exceedingly well brought out. Those troops that entered the war without them have set up such a cry for them that the authorities have been compelled to improvise wagons that could supply the shortage in some manner. This has been found necessary not only for the troops on the firing line but also for those in rear. For our troops special considerations as to type of wagon must be made due to peculiar conditions in Sweden. Among the great nations' armies it is well settled each company should have a one-team four-wheeled cook-wagon. These are collected by regiments and accompany the troops on the march and into engagements. The above mentioned wagon is the fundamental type of all cook wagons, with modifications thereon, to suit each nation's special requirements. That of Russia is particularly simple, the cooking arrangement being a single 300 liter kettle with the fire box, mounted on the rear axle. Though it can be unlimbered, each part cannot be hitched up and hauled separately. In contrast the Austrian and German wagon can be hitched to a single horse. The front limber carries utensils, a days' provisions and fuel; on the rear limber are mounted two kettles, one 200 liters and one 70 liters. The latter can be used for cooking coffee and warming water which is often done to dilute the thickly cooked food in the larger kettle. The kettles are not heated directly by the fire but are placed in glycerine baths, thus on one hand saving fuel and on the other, the kettles can be used as self cookers.

[The Evolution of the Ambulance. *Modern Hospital*, May, '16. 1200 words. Illus.]

(This article is a discussion of the transportation phase of the report of Surgeon A. M. Fauntleroy, U. S. Navy, on "Medico-Military Aspects of the European War." The illustrations show the various methods of transporting sick and wounded, from the two-wheeled cart without springs to the hospital train. The transportation problem is discussed in its relation to civilian hospitals. The utilization of all means of transportation and the carrying capacity of different vehicles are subjects of great importance.)

#### —Transportation of Sick and Wounded—Cost

[Transportation of Ambulance Companies. By E. C. Jones, Captain M. C., U. S. A. *Military Surgeon*, Nov, '15. 2500 words. Tables.]

A comparison of the cost and availability of motor and mule-drawn ambulances. Table obtained from official sources. Gives the cost of a mule-drawn ambulance company as \$21,094.71, a motor ambulance company figuring on twelve motor ambulances, one two-ton truck to replace three escort wagons and four pack-mules and five motor cycles to replace thirteen riding horses at \$11,133.20, including \$38.10 repair parts for each machine. Says two motor ambulance companies can be equipped for the cost of one mule-drawn company plus \$1171.79.

The cost of maintenance of the mule-drawn

company was \$6951.12 per annum for forage alone. The cost of the motor ambulance company is \$2397.50. This includes \$50.00 for each machine and \$15.00 for each motor cycle per annum for repairs, figured on the basis of 5000 miles per annum, oil and gasoline at retail prices.

The cost of moving a mule-drawn company 278 miles was \$285.81; the cost with motor transportation would be \$103. When not in use the cost of the motor equipment is also much less. The motor company will handle a much greater number of wounded in 24 hours, can cover longer distances at higher speed, with greater safety and more comfort to the injured.

#### —Transportation of Sick and Wounded—Hospital Trains

[Disinfection of Hospital Trains. *Illust. Kriegs-Chron.*, Daheim, Leipzig, '15, No. 26. *Modern Hospital*, Mar, '16. Quoted.]

Experiments have shown that high temperature combined with formalin vapors does not kill pus cocci, tetanus bacilli, and anthrax spores, though they were exposed to the disinfectant from three to six hours. The Germans have now devised a new method of disinfection for hospital trains. It consists in high temperature combined with a rapid withdrawal of moisture by the creation of a vacuum and with the use of formalin vapors. The apparatus is a large metal cylinder 23 meters long and 5 meters in diameter, and the covers at both ends can be hermetically closed. The car is pushed into this cylinder and the latter tightly closed. The apparatus is heated by steam by means of a system of tubes. The formalin apparatus is attached to the under side of the cylinder, and the air is pumped out of the cylinder by means of an electro-motor connected with a vacuum pump. While the apparatus is heated, the air is gradually withdrawn until water begins to boil at 40° C. The sudden withdrawal of moisture is fatal to the bacteria. The injection of formalin vapors makes complete disinfection a certainty. After an exposure of the car to this treatment for five or six hours, no living germs could be found.

[A Modern Hospital Train. By Alfred Gradenwitz. *Scientific American*, June 24, '16. 2300 words. Illustrated.]

The Bavarian State Hospital Train was built from funds provided by the German Museum of Munich, and every advantage was taken of the museum's experts in design and of German industry in construction.

The train is designed to carry about 200 patients and a service personnel of 45. The latter includes 3 doctors, 2 clergymen, 3 female and 22 male nurses. The remaining 15 have to do with the running of the train and preparation of food. The train comprises 14 soldiers' hospital cars with 14 berths each; one officers' hospital car of seven berths; one operation and X-ray car; one disinfection car; one lighting car; two cars for doctors, female nurses, and clergyman; two cars each for ten male nurses; one managers' car; one

**SANITARY SERVICE—Continued**

kitchen car; one kitchen provision car; one linen storage car; and three baggage and material cars—a total of 29.

In the soldiers' hospital car, each berth is designed to carry two stretchers, one above the other in spring supported frames. The upper stretcher may be pulled back or removed entirely to make the patient in the lower one more comfortable.

Each berth has a small table to use for dining and reading. All necessary accessories are provided, including closets, lavatory and washstand.

The officers' car has seven white enameled beds, spring supporters, but otherwise the car is the same as for the soldiers.

There has been discussion as to whether there should be an operating car, and it is regarded as necessary for possible emergencies. It is equipped for rapid surgical work (equipment described.—Ed.). The equipment of the remaining cars is that necessary for the special purpose. Both steam and formaline disinfection are provided for. The lighting car has 12-h.p. gasoline-engine-driven generator, supplying 380 lamps, with 60-cell storage in reserve.

The linen car contains 650 blankets, 600 sheets, 1000 table cloths, 1000 towels, napkins, etc., 1000 arm bands, neck cloths, handkerchiefs, etc., 300 "sick" suits, and a large number of other pieces of linen. Telephones connect the different cars.

[Army Hospital Train. *Army & Navy Register*, Aug 19, '16. 300 words.]

A hospital train of ten cars, designed by Capt. P. L. Jones, Med. Dept., has been completed and sent to San Antonio for service. The cars for patients have side doors, and regular hospital beds are used. End doors have been widened to permit transfer of patients from car to car. The train is rented by the government with provision for purchase.

[Motorcycle Ambulance of Double-Decker Design. *Scientific American*, Oct 7, '16. 400 words. Illustrated.]

(Describing a side-car attachment in which two stretchers are carried one above the other, thus doubling the capacity of the motorcycle for transporting wounded.)

—Transportation of Sick and Wounded—  
Motor Ambulances

[Automobiles for Military Ambulances. *Mem. de Artill.* (Spain), Apr, '15. 1200 words. 2 plates.]

On the recommendation of the Experimental Commission of the Artillery, the Section of Military Sanitation adopted the omnibus chassis of the Hispano-Suiza of Barcelona. This contains a 30-40 h.p. engine, with four 100 x 150 mm. cylinders, and is of a light and solid construction. Its total length is 5.33 meters, and the clearance of the lowest part is 245 mm. The tires are of solid rubber, and the wheels of wood.

Although it is evident that the wounded would be transported more gently if the tires were pneumatic, considerations of weight require the use of solid tires. Besides, service is not so sure with pneumatic tires, on account of damages to which solid tires are not subject.

Covered bodies for these chassis have been constructed with a seat for three persons and with room for three wounded. Boxes are provided under the seats for medicines, etc. A receptacle for 50 liters of potable water is provided.

The total weight of the ambulances ready for service is 2.88 metric tons, distributed as follows:

On the front axle.....1.04 metric tons  
On the rear axle.....1.84 metric tons

**SAN MARTIN, General**

[General San Martín in Peru. Translated from the English by Carlos Aldao. *Revista Militar* (supplement), July, '16. 21000 words.]

(Two chapters are translated of the work, "Extracts from the Diary written on the Coasts of Chili, Peru and Mexico in the Years 1820, 1821 and 1822, by Captain Basil Hall, R.N.")

Captain Hall, in command of the British sloop-of-war *Conway*, sailed from England in Aug, 1820, and cruised along the Pacific coasts as far north as Acapulco until June, 1822. His visits to the Peruvian ports gave him opportunities to learn something of the country and to travel in the interior of Peru at the very interesting time when the expeditionary column from Buenos Aires, under General San Martín, was operating there against the Spaniards. The original of this work was first printed in 1824.)

**SARMIENTO, Don Domingo Faustino**

[Don Domingo Faustino Sarmiento. By E. Cocchi. *Rev. del Circulo Militar*, Aug, '15. 2000 words.]

(A brief outline of the life of Sarmiento, who was a prominent educator, editor, and statesman of Chile and later of Argentina. He was elected president of the latter country in 1868 and died in 1888.)

**SCHOOLS, Military**

See also

EDUCATION, MILITARY—IN SCHOOLS AND COLLEGES

NATIONAL GUARD (U. S.)—INSTRUCTION AND TRAINING—TRAINING SCHOOLS

**Colombia**

[Military School of Colombia. Editorial. *Memo. Estado Mayor* (Colombia), June, '15. 400 words.]

This school was founded in 1907 by a commission of Chilean officers; its progress has been rapid and continuous, and it is now installed in commodious buildings of modern construction in the capital. The eighth anniversary of its establishment was celebrated by a *fiesta* in which the cadets particularly distinguished themselves in gymnastics.

[Non-commissioned Officers' School. *Mem. Estado Mayor* (Colombia), Feb and Mar, '16. 750 words.]

This school was organized in 1914 for the purpose of furnishing sergeants and corporals to the troops of the line. It is located in the San Diego buildings, adjoining the military academy.

There are 120 students formed into a company of three platoons. The course lasts one year, and upon graduation the students are assigned as 1st sergeants, sergeants and corporals to the different branches of the service, the academic standing determining the grade. The three highest graduates receive a scholarship to the military academy.

The course covers: tactics, fortification, weapons, interior administration, organization, military topography, military correspondence and papers, arithmetic, general history and history of Colombia, geography, languages (Spanish, French or English), drill regulations, and gymnastics. Instruction is given by specially qualified officers and by some officers of the General Staff.

Students come from two sources: 1. From the ranks; and 2. From civilian candidates who have passed a physical, moral and mental examination.

#### —Officers' Schools

See also

STAFF COLLEGES

#### Cuba

[West Point of Cuban Republic or Cuban School of Cadets. By Geo. W. A. Wuest, Official Representative. *Army & Navy News*, July, '16. 2600 words. Illus.]

Historic Morro Castle at the entrance to Havana harbor, is the location of the cadet school of the Cuban republic. The school was established to supply the need of trained officers, felt as soon as the Cuban army was created.

The course at the cadet school is two years, and embraces subjects of military nature only, viz: Infantry drill and organization, army administration, tactics, military topography and engineering, drawing, physics and chemistry, laws of war, penal law, military organization, telegraph and signalling, ethics and morals, hygiene, English, shooting, riding (which also includes hippology), fencing and gymnasium. The school is well equipped and efficiently staffed. Discipline is strict. An examination is held every month, and the monthly examinations count half of the final examination. Drill and riding are taken in the morning to escape the heat of the day and the rain, which, even in the rainy season, rarely falls in the morning. All drill is out of doors and there are no "off" days. The military reservation at the Morro is large and offers ample and varied ground for the training. High proficiency in swimming is insisted upon. The physical effect of the system of training is very noticeable. The cadet corps drills as an infantry company officered by themselves, and the cavalry training as a troop is even more severe. The course in-

cludes bareback and saddle riding, and saddle and bareback jumping. In tactics and war games, and in topography and military engineering, the instructors have passed through the Fort Leavenworth (U. S.) schools, and Fort Leavenworth methods are used. Fencing and gymnastic work are carefully taught, with excellent results. The defenses of Havana afford abundant opportunity for artillery instruction. English is compulsory, the aim being a good working knowledge.

The staff of the school is carefully selected from officers of the army. The morale is excellent.

#### SCOUTING

See

RECONNAISSANCE

#### SEAPLANES

See

AERONAUTICS

#### SEARCHLIGHTS

[Searchlights; a Short, Annotated Bibliography of their Design and Use in Peace and War. By H. E. Haferkorn, Librarian, Engineer School. *Professional Memoirs*, Jan-Feb, and Mar-Apr, '16. About 10,000 words.]

(A list of 172 annotated and indexed references to the literature of searchlights, their technical features, applications, etc.)

[Searchlight Carbons. By R. B. Chillas, Jr., Chemical Engineer, Experimental Laboratory, National Carbon Co. *Jour. U. S. Artill.*, Mar-Apr, '16. 9000 words.]

(A lecture delivered before the student officers in the Dept. of Engineering and Mine Defense, Coast Artillery School, Oct 15, 1916.

This is a technical article, giving a brief outline of the manufacture of searchlight carbons, considerations governing the choice of carbons in searchlight operation, and candle-power measurements of searchlights.)

[Notes on the Employment of Searchlights and Illuminating Projectiles in Field Operations. By F. di Tondo, Capt. of Engrs. *Rivista di Artiglieria e Genio*, Apr, '16. 5000 words.]

The increasing frequency of night operations has added to the importance of illumination of the battlefield.

#### Searchlights

A searchlight unit consists of a projector and a generating set. The projector consists of an arc light and a reflector, and is movable in both the horizontal and the vertical plane. It has a shutter for occulting the light and an iris diaphragm for reducing the light to any desired extent. The projector may be manipulated directly or by electrical control from a distance.

The generating set consists of a dynamo operated by a motor which may also serve as motive power for transporting the unit. Other methods of transportation include the use of a carriage like that of a field gun, or of a two-wheeled cart, or of pack animals. The choice of method depends on the size of the unit and the nature of the ground.

**SEARCHLIGHTS—Continued**

The caliber of the searchlight is the diameter of the reflector, which may be from 10 to 60 inches, with a range from 800 to 5000 meters. The illuminating power of a 36-inch searchlight at 1000, 2000, and 3000 meters is, respectively, 53, 12, and 5 candle-power per square meter. Five candle-power per square meter is 35 times the light of the full moon.

Visibility under the searchlight depends on the nature of the target and its background. Light objects appear closer than they really are. Colors are changed; yellow appears white; light green appears yellow; gray uniforms are hard to see; troops dressed in white or black are easily visible. Arms and metals in general reflect light and are easy to discover. Horses' eyes show clearly of a greenish color even at great distances. Small groups of men can be seen up to 2000 meters. Moonlight reduces the effect of illumination; dampness and rain diminish the range; and fog destroys all effect.

The best position for the projector is on an elevation so located that the light can search the folds of the ground. The generating set should be under cover and connected with the light by cable.

There should be an observing station, higher, if possible, than the light, or to one side of the light 50 meters or more. The observer should familiarize himself with the ground by day and make a sketch showing important points and horizontal and vertical setting of the projector to cover them. The observer may control the light if he is close enough; otherwise he is connected by telephone with the electrician who moves the light as directed.

The light may be used for watching movements of the enemy, for illuminating targets for firing, for moral effect in discouraging hostile operations, for blinding the enemy, or for signalling. It is particularly useful on the defensive.

The field should be divided into sectors assigned to lights of appropriate power, depending on the nature of the ground. The lights should not be in a straight line, and should not indicate the flanks of the position. The ground should be illuminated at short, irregular intervals of time. If it is desired that a certain target be kept illuminated, it should be covered first by one light and then by another. Obstacles should not be illuminated till the enemy reaches them and is under fire. For ranges under 1000 meters there should be numerous small lights, about six to the mile of front. Oxy-acetylene lights may be used for this purpose. The large lights will then cover the enemy's reserves.

On the offensive, the searchlight is used to illuminate hostile positions under artillery fire, to disturb hostile working parties, to blind the enemy and neutralize his lights, to light the ground in advance of the attacking troops, to assist in the destruction of obstacles, to watch the enemy's reserves, and to cover the retreat in case of a repulse.

In colonial wars the searchlight is not usually of great importance, because of the ab-

sence of hostile artillery and the presence of more cover and greater inequalities in the terrain.

In using large searchlights, regular procedure of sweeping horizontally and vertically should be followed, in order that all ground within range shall be covered.

Troops attacking at night must avoid discovery by hostile searchlights, as far as practicable. They must utilize cover, avoid roads and slopes descending toward the enemy, keep weapons and bright equipment concealed, throw themselves to the ground when illuminated or if possible before the beam reaches them, and move rapidly when the beam is taken off. In open country the men may be required to carry brush to screen themselves when under the light.

Searchlights are but slightly vulnerable. It is difficult to estimate their distance, and their blinding effect makes it hard to aim at them. If they are to be attacked by artillery the fire should be watched by observers placed to one side of the battery. Percussion fuses should be used. Rifle fire is useless except at very short ranges.

Russia is considered to be in advance of all other nations in searchlight equipment. After the war with Japan, she reorganized her equipment and now has twelve units for each army corps: two for corps headquarters, one for each of the two divisions, and one for each of the eight regiments.

*Illuminating Projectiles*

These furnish illumination either by a light carried by a parachute or by a burning substance liberated from the projectile when it bursts. The first method, used by Germany, Russia, Japan, and Austria, excels in clearness and duration the second, used by England and France.

The projectiles are thrown into the air by howitzers or mortars, and give a light lasting from 15 to 40 seconds. The great advantage of this form of illumination is that, as the light comes from overhead, it does not cause the deceptive shadows that are made by the searchlight.

The Germans experimented in 1910 with pistols capable of illuminating a radius of 200 meters for 20 seconds. They are used for showing the direction of march, for illuminating a zone of the battlefield, or for signalling.

[The A G A Searchlight. By Lieut. P. Welin. *Svensk Kustartilleritidskrift*, Part 2, '16. 2200 words. 6 illustrations.]

The A G A light, the name of the Swedish A/B Gas accumulator, well known from its use in lighthouse illumination, has also proved suitable for searchlight use and a projector for infantry, using this light, has been adopted.

It has also been used in larger searchlights for both land and coast fortifications.

The source of the light is *dissous-gas*, which is acetylene dissolved in acetone. The gas is manufactured and put into accumulators of suitable sizes for the use for which they are

intended. A description of this work, with illustrations of the gas stations, etc., in which this work is done, is given.

A description and illustration of the 40 cm. infantry searchlight, which has an illuminating distance of about 750 yards, is given. Searchlights for fortifications are made in two sizes, of 40 cm. and 60 cm., and descriptions and illustrations of these are also given.

An apparatus using this light for signalling is also in use. A description is given.

#### —Instruction in Use of

[Searchlight Instruction in the French Army. From reports furnished by Colonel Echagüe and Lieutenant-Colonel Benítez, representatives of the Spanish Army in France. *La Guerra y su Preparación*, Madrid, July, '16. 2250 words.]

Deficiencies observed in the handling of searchlights led to the establishment, during March-July, 1915, of a school in the zone of operations; the course lasted six weeks, and from 600 to 1200 men were in attendance at one and the same time. We give here the rules drawn up by one of the instructors on the use of the field-apparatus in combat.

There are two classes of projectors, oxy-acetylene, of short range, and electric of great range. The first, 24 to a section, are transported in 4-horse trucks, 4 lights to a truck. The section has besides a 4-horse spare-part wagon, carrying material for 12 projectors.

Electric projectors in use are: (a) 40-cm., carried by pack; (b) 40- and 60-cm., horse-drawn (2 horses for the 40, and 4 for the 60); (c) 60- and 90-cm., automobile. The section operates 4 horse-drawn projectors and 2 automobile, all of the same type in a given section. It is commanded by a lieutenant, first or second, and is divided into operating squads under the command of a corporal or of a sergeant. There is a chief of squads for every four projectors; 2 men, 2 mechanics and 2 electricians are assigned to each oxy-acetylene light. The automobile squad has besides, a driver.

The instructor is an officer, assisted by the chief of squads; he instructs in operation, maintenance and repair, using for this purpose an already trained squad working in the presence of the learners.

In order to illuminate an object, one must first find it, then follow it or keep on it;

the beam must be turned on and then cut off. The chief of section places the students a few meters behind and some 40 meters to one side of the projector. He then points out some clearly visible object, a house, a wall, 1500 meters off, and repeats, increasing the distance by 200 meters up to 2500 for this class of objects. Next, with his class at the same post of observation, he selects at 300 meters a moving object (a wagon, or a group of men walking), and continues increasing the distance by 100 meters up to 1200. This sort of instruction terminated, the class practices picking up known objects (houses, etc.) at 800 m.-2500 m., and passes to groups of men at 300 m.-1200 m., proceeding by jumps of 50 m. from a distance of 800 m. The next step is to pick up isolated men, beginning at 100 m. and going up to 600 m.; after some practice in this, the business of keeping on a moving object is taken up; the personnel is also exercised in leaving a given object unilluminated by rapidly passing over it. The projector must be so placed to keep the beam close to the ground.

#### Employment of Projectors in Combat

They may be used for reconnoitering enemy positions, and for actual conflict. The searchlight is of great assistance in night firing; it takes the enemy by surprise, blinds him, and makes him visible under conditions depending, to be sure, on the hygrometric state of the air, on the diameter of the projector, and on the angle of site.

In order to direct the beam properly, conspicuous points of the terrain are marked by day, so that when night comes, the beam may be promptly directed upon these points or their neighborhood. It is impossible to aim or fire accurately when dazzled by a searchlight; besides, flashes and occultations in alternation confuse the enemy, horses are frightened, and even trench-work has to stop.

The greater the angle made by the illuminated zone with the axis of the beam, the greater is the area of this zone, but also the greater is the number of rays lost in the illumination of a given object in that zone. Moonlight diminishes the usefulness of a searchlight less than one might think.

In normal weather, field projectors can make objects visible, and therefore vulnerable at the following distances:

		Cylindrical Beam at meters	Divergent Beam at meters
(90 cm.)			
Buildings	Naked eye	2500	
	With Field Glasses	3500	
Persons (Company or groups)	Naked eye	1400	700
	With Field Glasses	2000	800
Individuals	Naked eye	800	600
	With Field Glasses	1200	700
(60 cm.)			
Buildings	Naked eye	2200	
	With Field Glasses	3000	
Persons (Company or groups)	Naked eye	1000	600
	With Field Glasses	1500	700
Individuals	Naked eye	700	500
	With Field Glasses	900	600
(40 cm.)			
Buildings	Naked eye	1500	
	With Field Glasses	2200	
Persons (Company or groups)	Naked eye	800	500
	Naked eye	600	400
Individuals	With Field Glasses	800	500

**SEARCHLIGHTS—Continued**

It is assumed that the troops illuminated are standing and wearing gray or light blue uniforms, and that the brilliant parts of the equipment are covered; kneeling, visibility is reduced one-half, and, of course, more yet if troops are lying down.

The width of front illuminated by a cylindrical beam is approximately one-twelfth of the distance; a divergent beam gives a width 4 times wider, but the intensity is reduced at least one-half. The depth illuminated varies with the angle formed with the ground by the vertical to the axis minor of the pencil of rays.

Light colors and yellows appear white; green, yellowish; troops in white or in dark uniforms are easily picked up, because they stand out on the background. Greens and light blue are hard to distinguish against a green backing. The brilliant parts of arms and equipments are conspicuously visible; gun flashes and the light of a lantern are difficult to see.

Excessive humidity is a greater obstacle to the passage of searchlight rays than heavy rain or snow; drizzle considerably reduces the range; fog and smoke reduce it to zero.

The only defense against dazzling is dark glasses; to lower the visor or insert leaves under the front of the cap is of little use, and, besides, makes reflections possible. The eyes of a horse, illuminated by a projector, look like phosphorescent lights.

In selecting the emplacement of a projector, the following conditions must be observed: it must have an ample field, cause no annoyance to friendly troops, be easy of access, and easy to leave; it must also have protection, natural or artificial, against enemy projectiles. Special troops are not required for its protection; should circumstances call for them, however, they must entrench as closely as possible.

1° *Oxyacetylene 35-cm. light.* Because of its low power, the pencil of rays must be cylindrical: groups of men may be picked up by the naked eye at 150 m.-200 m.; with field glasses at 250 m. The breadth of the illuminated zone is 10 m.

**2° Electric projectors:**

High-powered searchlights may be used: 1st, to assist in the exploration and reconnaissance of the terrain; 2d, to illuminate targets; 3d, to facilitate the march of columns; 4th, to conceal the movements of friendly troops; 5th, to blind enemy projectors; 6th, to blind the enemy; 7th, to deceive him by feints; 8th, to demoralize him; 9th, to illuminate work of all natures; 10th, to communicate with distant detachments and to make signals; 11th, in aviation.

When illuminating a target for the artillery, the projector must be in communication with the battery and under the orders of its commanding officer; the beam must show the shortest time possible. A shot or shots having been fired, the beam must appear only so long as may be necessary to observe the results of fire and to follow the target, if this

be necessary. Similar rules obtain for rifle and for machine-gun fire. Even when the situation becomes critical, projectors must not be withdrawn. On the march, the projector must not be withdrawn, except by order of the officer commanding troops. On the march, the projector may be used to illuminate selected points of direction and even part of the road itself; the troops take the unilluminated part of the road.

The difficulty of seeing through the beam suggests its use to conceal from a flank the movements of friendly troops; this is possible, however, only in flat country, because the projector must be at the same height as the object to be concealed. Another system, delicate of application, consists in moving the luminous sheaf in front of an advancing body.

The action of an enemy projector may be neutralized by cutting his beam with another of equal or of greater power. Dazzling may assist an attack; the beam is shifted back and forth over the enemy front, and an alternation of flashes and eclipses is made. This employment gives greater results when used against mounted troops.

By night, the ray becomes invisible at distances varying between 20 and 100 km.; communication may be established by Morse or other conventional signals. When projected on the clouds, visibility is possible up to 70 to 80 km.; by day, the projector may be used instead of the heliograph, but it must be oriented. There is reason to believe that a divergent beam will illuminate the ground sufficiently well to allow an aeroplane to alight.

The distribution of projectors is controlled by the necessity of being able thoroughly to illuminate the ground; it is convenient to use them in pairs, one to search, the other to illuminate. As a general rule, to each kilometer of front is assigned one projector. Alternations of flashes and eclipses are found best; the beam is flashed as a surprise upon a target selected by day, simultaneously with the fire of artillery or infantry upon the target; the duration of illumination is determined by the officer commanding troops. Searchlights should not be used in the assembling of troops for attack; the enemy would be warned.

Besides using such natural protection as is available, raising and lowering the projector, while varying the intensity of the beams and occulting it from time to time, will increase the difficulty of the enemy in determining its distance.

The chief of section is responsible for all technical and tactical details, and for the care of his material; he must so instruct his chiefs of squad that they can take his place in case of need. These follow the same course with their men.

During winter, the radiators must be daily inspected to see that they are empty; the inspection is unnecessary if water and glycerine are used (one-tenth glycerine).

Parapets to protect projectors are built by the troops, upon request to their commanding officer.

The neighborhood must be cleared by removing all objects that would interfere with the ray (tall bushes, branches, etc.). The chief of section must cause his men to acquaint themselves with the phases of the moon, hour of rising, etc., etc.; the duty in hand terminated, everything must be put in order for immediate use at a moment's notice before any rest is allowed. The chief of section may serve, upon occasion, as observing officer. The dazzling effect produced by the proximity of the ray interferes with the operator; hence the capital need of an observing officer, in a sheltered spot beyond the projector, and some 40 meters to its side, and connected by telephone with both the operator and the commanding officer of the troops engaged. If, in order to see better, the observer must move forward, he should place himself below the beam; if he must observe from the apparatus itself, he should be below the cone of rays. He may shift station, if he thinks it proper, under escort if necessary. During the day he must prepare himself for his night duties by making a minute examination of the ground, by consulting maps, and by making sketches and silhouettes of objects, so as to be able to recognize them easily at night. He should not lose sight of his principal object—the illumination of the flank: which the enemy might attack. Field glasses are indispensable for observation.

#### —Portable

[Portable Search Lights in the Field. By Capt. Teiji Yasushina, Japanese Army. *Kaikosha Kiji*. Sept, '15. 4500 words.]

The increased importance of night operations is recognized by every one, but the enemy's ability to conceal his movements and take advantage of the darkness can be offset by a proper use of searchlights.

To fully answer their purpose, they should fulfill the following conditions:

1. Be really portable—susceptible of being taken anywhere.
2. While lighting up hostile position, they should not disclose friendly troops.
3. Be sufficiently powerful to disclose the hostile forces and movements, and important tactical points.
4. Should be used so as to dazzle the enemy suddenly.
5. Their operation, setting up and withdrawal should be simple.

The necessary personnel consists of one officer as observer, one non-commissioned officer in charge, and four operators. Not only should these men be thoroughly trained for this work, but men in each company must be trained for it in peace time in order to provide for filling vacancies.

#### The Officer-Observer

He is directly under the orders of the commander of the troops and should locate the searchlight according to his orders. The duties of the officer-observer are:—to maintain connection with the commander and with the n.c.o. in charge; to keep the ground in front constantly under observation; and to

make the necessary reports. Connection is maintained by telephone, relay sentinels or signal lights. The selection of the position of the officer-observer is important. It should generally be in front of one flank of the position, not within the rays of light from the machine, at a point from which with field glasses he can observe all important points. He should, if possible, reconnoiter in day-time the ground to be observed at night, so as to become familiar with the folds in the ground. Learning to interpret the ground as he sees it at night is an important element of his training. In emergencies, he decides on changes of location of the searchlight and makes reports direct to his immediate superior in addition to reports to the commander of the troops.

#### The Non-Commissioned Officer in Charge

He is directly under the orders of the officer-observer and his principal duties are to set up the light where ordered, supervise its operation, keep it in good working order, control the operators, keeping them constantly in the vicinity for the safety and protection of the machine. In emergencies he should act on his own initiative.

#### The Operators

They are charged with the care, preservation and safety of the light, its transportation, setting up, and handling under the direction of the non-commissioned officer in charge, each man being assigned to specific duties.

#### The Location of the Searchlight

This is determined, in all cases, by the commander, based on the following considerations:

1. Absence of obstacles that will obstruct the rays.
2. Good observation station with good communication nearby.
3. Space sufficiently wide for ease of manipulation.
4. Friendly troops should not be dazzled nor their view or fire hindered by its rays.
5. Protection from view and fire of the enemy.
6. Suitability for its advancement or withdrawal.

A perfect position is impossible, but one permitting the lighting up of the ground in front must be had and, once selected, the observer at once begins to reconnoiter the front.

Conspicuous ground objects, land marks, ground over which the hostile artillery has ranged, etc., should be avoided. Generally speaking, the location should be on high ground and slightly in front of a flank.

#### Method of Using Searchlight

Brief intermittent flashes are preferable to long continuous exposures. In the latter case, the enemy will at once conceal himself or will be afforded an opportunity for ranging. It will thus eventually draw his artillery fire, and, although searchlights make difficult targets, they are not impossible ones. On the other hand, the incessant flashes are most bewildering, and the more skillful the operators in this respect, the greater will be the fatigue,

**SEARCHLIGHTS—Continued**

bewilderment, loss of morale, and finally absolute panic of the enemy unless they can avoid its rays. Its best use, then, is to make brief flashes here and there over the field of approach.

*Its Influence on an Attacking Force*

From our maneuvers we learned that:

1. The men wish to hide, especially when several lights are playing on them.
  2. Being suddenly thrown from light into darkness is very confusing.
  3. Means for protecting the eyes should be provided, such as smoked glasses or eye shades.
  4. To avoid reflection, saber scabbards should be wrapped in a light colored cloth, arms kept "at trail," and bayonets not fixed.
  5. The white signal flag of the commander should not be used closer than 300 meters.
  6. Advantage should be taken of folds in the ground and all ground objects, both at the halt and while advancing. The front rank men may carry branches of trees.
  7. They should lie down quickly and not move.
  8. An immediate advance after a flash should be avoided.
  9. Firing successfully at a searchlight is possible when the light is weak. Distance for about 20 meters on each side is dangerous ground.
  10. Distance to the search-light is generally overestimated, varying with the strength of the light.
  11. Generally, troops directly in rear of the light are blinded and unable to see.
- In maneuvers over level open country, with battalions in line of company columns and with companies in column of platoons, advancing with patrols out to the front and flanks, our experience from the defender's viewpoint was that:
1. Within 300 meters, the formation of a moving enemy was generally recognized, but his clothing and equipment were not. Moving patrols could be detected, but, when lying down both individuals and groups were invisible.
  2. At 200 meters, the formation was clearly recognizable, but only in the erect position. Color distinctions were easy, especially the tea-brown color. The order of dress and black were indistinct.
  3. At 100 meters, formation, posture and uniform were easily recognized.
  4. At distances above 300 meters, unless the configuration, weather and position of the light were favorable, recognition was difficult, but up to 500 meters, the general outline of the hostile line could be seen.
  5. The position of the observer should be about 100 meters to one side and in front of the machine.
  6. The defenders within 20 meters to the right and left of the light are unable to see the target.
  7. Light colored buildings, stone fences, etc., in the vicinity lighted up the friendly position by reflection.

8. By changing the location of the light after each flash, the enemy's direction of attack is changed.

9. Estimation of the distance to the attackers is very difficult, especially if the time of exposures is short. In most cases, it will be underestimated.

**SECURITY AND INFORMATION**

See

CAVALRY—SCOUTING AND RECONNAISSANCE  
ESPIONAGE  
EUROPEAN WAR—NEUTRALITY, ASPECTS OF  
LINES OF COMMUNICATION  
MAPS AND MAPPING  
OUTPOSTS  
PHOTOGRAPHY  
RECONNAISSANCE  
SIGNALLING  
SKETCHING

**SEMAPHORES**

See also

FIELD ARTILLERY—FIRE CONTROL—INSTRUMENTS AND EQUIPMENT—SEMAPHORES

**SERBIA****—History**

[The Strategic Significance of Serbia. By Dr. Niko Zupanic. *Nineteenth Century and After*, Nov, '15. 4200 words.]

The mere fact that Germany is directing the armies of four states against so small a country as Serbia is significant of the latter's importance. Ever since the 18th century, Russia has sought to obtain the control of the Bosphorus and of the Dardanelles. This Austria has tried to prevent, because she wishes to be herself supreme in the Balkans, an ambition in which she had the support of Germany. Just as Russia has set her hopes on Constantinople, so has Austria fixed hers on Saloniki, and on the acquisition of Serbia. Her defeats in 1859 and 1866 have imposed on Austria a purely passive foreign policy, except in the Balkans. Here her diplomacy has been increasingly active; her policy, certain of German support, daring and energetic; in fact, it may be said that she has been Germany's agent. Now, foreign policy, other things equal, is largely determined by geographical-strategical considerations. Hence the importance of Serbia, lying as it does across, and commanding, the great natural highroad that connects Asia and Europe. This highroad runs along the Danube Valley as far as Belgrade, near which opens the broad valley of the Morava. This valley leads from the neighborhood of Belgrade to the south, in an almost straight line to Saloniki. At Nish, the road forks. One branch goes southeast, crosses the mountains by easy passes, descends into the valley of the Maritza, follows that river to a point beyond Adrianople, and then goes on to Constantinople. The other branch follows the Morava beyond Nish, threads its way through the mountains when it reaches the valley of the Vardar, which it follows until it terminates at Saloniki. The routes first sketched form the easiest connection between Asia and Europe, and are to-day made still more impor-



tant by modern highroads and railways. We can realize the value of these roads by taking into account Germany's designs on Asia Minor, rich in mineral and other resources. In the light of these designs, the Berlin-Bagdad railway ceases to be merely an economic undertaking, and we can understand why, in the Balkan war, Austria, doubtless inspired by Germany, announced that she would attack Serbia if the Serbians retained the ports which they had conquered on the Adriatic. The retention of these ports might have blocked the Austro-German purpose at the right moment to seize that part of the strategical highway to Saloniki and Constantinople which is [or was] in Serbia's keeping.

Now Germany's control of the route in question would undoubtedly be followed by an attempt to control the water gate between Europe and Asia—the Suez Canal. The desert lying between Asia Minor and the canal can be conquered by railways. German domination of Asia Minor, the construction of railways in the direction of Egypt and India would probably make Egypt untenable and gravely threaten England's position in India.

The significance of Serbia appears in yet another way. The captured territory held both east and west by the Central Powers is valuable industrially. But the British blockade has produced a scarcity of food and of raw materials, particularly of metals. Now these can be furnished by Turkey. Bulgaria, to be sure, has cast in her lot with the empires, but organic connection between Austria-Hungary and Turkey can be established only through Rumania and Serbia. Rumania so far has refused passage to German war materials through her territories. Hence the recent assault upon Serbia. Even if the Germans should not succeed in holding the 200 miles of railway from Belgrade to the point at which it crosses the Bulgarian frontier, they could still construct a line, only 30 miles long, from Orsova to the nearest Bulgarian town, and thus establish communication between Germany and Turkey. The Danube could be used as a line of transportation with this new railway. Moreover, this corner of Serbia contains immensely valuable copper mines.

In general, the German invasion of Serbia is an attack on civilization in general, inasmuch as it makes possible a combination of German organization and thoroughness with Mohammedan fanaticism.

[The Sacrifice of Serbia. By Robert Machray. *The Nineteenth Century*, Jan, '16. 8500 words.]

(A popular article, sufficiently described by its title, in which the Serbo-Balkan situation of the past few months is set forth in considerable detail.)

—Railroads

See

RAILROADS—SERBIA

## SEVEN WEEKS WAR

[Among the Cliffs of Trentino in '66. (The Semi-Centennial of Bezzeca.) By Major

Sinopoli. *Riv. Mil. Italiana*, Aug, '16. 9000 words.]

Bezzeca forms a brilliant page of Garibaldian history, and it is well to recall it in order to show that the soldiers of Italy in other times, as well as in the present, have known how to fight and to conquer.

Between 1860 and 1866 there was in Italy a constant study of the best method of rectifying the boundary between Italy and Austria. There proved to be only one solution—war. The volunteers in this war were commanded by Garibaldi. The government authorized the formation of volunteer battalions, but unwisely prescribed for them the discipline of the regular army. It would have been better to have depended on the patriotic spirit of the troops to keep up their morale and to have devoted the energies of the government to supplying them with arms, ammunition, clothing, and food. By the middle of June there were 40,000 volunteers in service.

The operations of Garibaldi had as their starting-point the great plain of Lombardy, from which he proposed to invade the Tyrol, a mountainous and difficult terrain. The two colossal figures of the war were Garibaldi and Kuhn. The young Italians, untrained, poorly armed, new to the mountains, were opposed by the Tyrolese hunters, acquainted with the locality, trained to this special service, and armed with a carbine having a range of 1200 m. After some preliminary successes, Garibaldi's progress was arrested by the report of the defeat of the Italian army on the Mincio. He was forced to fall back and protect the principal cities of Lombardy.

In Lombardy, after getting the best information to be had regarding the enemy, Garibaldi divided his army into two parts, one to operate against Kuhn for the defense of Valtellina, and the other to take the offensive by marching in mass on Trent. Both enterprises were successfully conducted, from a military standpoint.

Garibaldi showed his military genius in the way he handled the volunteers that made up his army. He organized in each regiment a flying company, containing the most active and hardy men, and also a reserve company, consisting of the men least fitted for the fatigue of war. He laid down rules for the flying companies, prescribing for them the duty of harassing the enemy, and directing that they march preferably by night and rest in concealment by day.

Special training was necessary to fit these men for operations in the mountainous country. Garibaldi issued orders instructing his men as to the advantages of occupying the hills dominating the positions of the enemy, the value of the open order of attack, the needlessness of panics on night marches, and the necessity of moving with a minimum of transportation. He allowed two carts to a battalion.

In the mountains the Austrians had erected forts, some of which were located on high points considered impregnable. To reach these points the Italians had to climb on hands

**SEVEN WEEKS WAR—Continued**

and knees; they also dragged their artillery with ropes to positions where it could be used. Their operations not only showed enterprise and courage, but they were also marked by brilliancy of conception and execution.

Bezzecca was one of the most important towns in the mountain country. Its military importance arose from the fact that it controlled a principal line of communication. Garibaldi saw the necessity of occupying the place and sent a force to take it. The town was defended by the Austrians under the personal direction of Kuhn. The Italians had four field pieces against twelve of the enemy. They made up for the disparity by their desperate courage, charged the enemy with the bayonet and put him to flight.

An armistice arranged by the political authorities prevented Garibaldi from reaping the fruits of victory by taking Trent, and the city remained for him an apple of Tantalus.

The day has come at last for the Italians to take what they missed in 1866.

**SHELL SHOCK**

[Shell Shock. Editorial. *The Army & Navy Gazette* (London) June 17, '16. 350 words.]

From a leading article in a medical paper it seems that the treatment of shell shock in many cases is quite elementary, especially when the case is diagnosed as being of a mild nature.

Our medical contemporary tells us it consists in leaving the patients alone and hoping for their recovery, or boarding them out for rest-cures in some country cottage. Recovery may possibly result from either of these methods, but it is infinitely more probable that recovery could in most cases be expedited by admitting such patients to *Suggestion Hospitals*. We appear to be the only belligerent nation which has no such hospitals, but there seems to be no good reason for continuing in such a humiliating condition. The other nations have each a number of such hospitals where cases are sent as early as possible, and where they receive suggestion treatment from the moment of arrival. These other nations, and especially the German, are able to return to the ranks a larger proportion of men than we do. Mild cases could be cured much more quickly by this method, and there are many cases which have no hope of cure except by proper and early treatment such as could be given in these hospitals by those who have had special training in suggestion treatment.

[The Treatment of War Psychoses. *The Canadian Military Gazette*, from *Military Mail*, Jul, '16. 1600 words.]

The term "shell shock" refers to all kinds of nervous break-downs, and many men so affected suffer more than some seriously wounded.

There are two methods in England of treating the large number of men suffering from

shell shock constantly being returned from the front as useless. One consists in gathering them all in hospitals without any classification. In some of these hospitals the doctors are not specially fitted for this kind of work. The other method consists in putting the patients in country cottages instead of hospitals and giving them the rest cure.

In Germany, however, the patients are sent to suggestion hospitals, where they receive treatment by suggestion at the earliest possible moment.

Their success in this method of treating these sufferers is shown by the fact that they return a larger number of the injured to the ranks than does England.

The construction of a model suggestion hospital is urged. This hospital can be copied when it has proved its worth. To this model hospital should be sent 100 cases of shell shock. They should be placed entirely under the control of one efficient psychotherapist who would be responsible for all treatment and who should have power to call in the necessary specialists for exceptional cases. He would have as assistants the required number of persons well trained in suggestion treatment. These persons, who might also be trained nurses, with the necessary quota of matrons, housekeepers, servants, etc., would be all that would be required. The cost of preparing and maintaining such hospitals would be very small as compared to what the government has to pay in keeping and pensioning these men who might otherwise be restored to health and usefulness.

**SHIPS AND SHIPPING (Merchant)****—Destruction of**

[Contrasts in Sea Methods. By Arthur Pollen. *Land and Water*, May 4, '16. 2500 words.]

The military effect of commerce destruction is both indirect and unimportant. Campaign after campaign has shown its futility as a sole method of making naval war. The German submarine campaign has so far not approached the effectiveness of either the French or the American privateer.

Naval conditions have changed in a way that few realized before the war broke out. In previous wars the protection of commerce imposed extraordinary burdens upon the fighting navy. To-day it is the fighting navy that has imposed extraordinary burdens upon commerce. Great fleets of merchant vessels have been taken over for transports and supply ships for the army and navy. These requirements have withdrawn so much tonnage from civil uses that it may be necessary to put the building of merchant vessels on the same basis as naval shipbuilding or munition making.

Germany is reported to have 200 submarines ready for use. It does not follow that the efficiency of the campaign would gain proportionately if all of these could be put in the field. Submarines cannot work with other submarines in the sense in which surface ships can work together. A submarine is never part of an organized force. It is at most a mobile danger-point. If the ships that have

to pass the danger points have any internal or external protection, the risks they run are not proportionate to the number of danger points encountered. The risk to the submarines of multiplying their numbers in patrolled waters would be directly in proportion to their increase in numbers.

## SHIPS AND SHIPPING TRANSPORT

### Great Britain

[The Shortage of Shipping. *The Army and Navy Gazette*, London, Apr 8, '16. 300 words.]

Mr. R. P. Houston, M.P., head of a Liverpool shipping firm which bears his name, speaks from first-hand information of the alarming shortage of British merchant shipping. He realizes the present disadvantages, as well as the future peril to which this may lead. From one-half to one-third of the food supplies of Great Britain are now carried in neutral bottoms; if this continues we may soon become almost entirely dependent on neutrals for food supplies and they may insist that the supply will be continued only on condition that we make peace with Germany. The idea in sinking neutral boats is not mere frightfulness, but a very far-sighted policy of reducing the world's supply of tonnage, so that they may reduce us to a condition of starvation, and after the war is over resume the struggle for commercial supremacy with a superior merchant fleet. Once again it is urged that a naval officer have a seat on the Board of Shipping Control. Had the cabinet taken the advice of seamen earlier, the present stringency would never have arisen.

[Losses to Merchant Shipping. *Independent*, Apr 24, '16. 200 words. Tables.]

According to a statement by Admiral Sir Cyprian Bridge, the total loss of merchant shipping to Mar 23 was 980 vessels. The principal loss was the British loss of 379 steamers, 31 sailing vessels, and 237 trawlers, amounting to six per cent. of the total British tonnage. French, Russian and Italian losses were 7%, 5%, and 4½% respectively. British shipbuilding has been so rapid that there has been a net gain of 344,000 tons since the war began.

## SHOES AND BOOTS

[A New Military Shoe. *Army and Navy Register*, Dev 11, '15. 300 words.]

A new kind of shoe, suggested for use in the army, is one having an upper extension of canvas, which has the effect of converting the shoe into a canvas-top boot. It is a combination shoe and leggin, and has the advantage of avoiding the separation of two articles so commonly used together.

It is not probable that this shoe will be adopted in the near future, since such a change would mean an extra expense, and the present army shoe is giving almost perfect satisfaction.

[A New Army Marching Shoe. *Army and Navy Register*. Feb 19, '16. 250 words.]

The improved army marching shoe now being considered by the quartermaster general is a combination of the French army and Belgian army shoe. The principal objection to the present shoe is its light weight. The new type is heavier and more rugged in appearance, with hob nails and heel plates. Before final adoption it will be thoroughly tested under service conditions by at least a battalion of infantry and several troops of cavalry.

[Note. *Army & Navy Jour.*, Apr 22, '16. 250 words.]

The tan marching shoes now issued to the (U. S.) army are not suitable for field service. In the sand of Mexico they have been cut to pieces and have made the men's feet sore. The lining wears out and thus causes trouble. The French, Belgian, Greek and Italian shoes have no lining.

Two new types will be tested, of the same shape as the present marching shoe, but with the smooth side of the leather in and no lining.

[The Army Shoe. *Army & Navy Register*, June 3, '16. 150 words.]

The Mexican operations have afforded a good test of the Army shoe. It is generally commended, but the sole is too light for that severe service. To remedy this difficulty, it is recommended that a supply of half-soles, hob-nails, brass brads, and hammers and lasts be issued, so that each organization can do its own repairs, especially half-soling.

[Note. *Army & Navy Jour.*, July 1, '16. 250 words.]

A new shoe is under test by the army on the border. The present shoe did not stand up under the rigorous conditions. The result will doubtless be the issue of two types. The present model is extremely satisfactory as a garrison shoe, and the shape will be retained in the new field shoe. The construction will, however, adopt the lessons of the European war. The leather will be used smooth side in, with no lining, thus obviating the principal cause of trouble. The appearance is too rough for garrison wear.

[Note. *Army & Navy Jour.*, July 1, '16. 100 words.]

Following an initial order for 30,000 pairs of the new type field (U. S.) shoe, based upon the French and Belgian trench shoe, orders were placed this week with New England manufacturers for about 250,000 pairs of the new type shoe.

See also

FEET—CARE OF THE

## SHRAPNEL

—Fuse—Height of Burst

See also

FIELD ARTILLERY—ADJUSTMENT OF FIRE

—Fuse—Height of Burst

See also

FIELD ARTILLERY—ADJUSTMENT OF FIRE

**SHRAPNEL—Continued****—Timing of**

[The Observer's Rule of Thumb. By Captain D. G. T. Sneyd, R. G. A. *Jour. Royal Artillery*, Oct. '15. 500 words. 2 diagrams.]

As the "splash" of the bullets from a time shrapnel, air burst, is frequently missed, it is useful to have some simple rule of thumb for calculating the distance of the mean point of impact from the target. Assuming the battery line of fire (*BT*) to be approximately correct, this can be done if we know:

(a) The distance of the burst from the target (*T*) on the line of fire for a burst observed from some point, as *O*, as  $1^\circ$  off the line, observer to target; and

(b) The distance ahead of the burst of the mean point of impact for a burst observed from *O* as  $1^\circ$  high.

To find (a):

Up to an apex angle  $OTB = 60^\circ$ , divide the observer's range (*OT*) by the apex angle. If  $OTB$  be greater than  $60^\circ$ , divide *OT* by 60.

To find (b):

Divide the observer's range (*OT*) by the angle of descent.

Bursts observed at angles other than  $1^\circ$  will, of course, be at proportional distances.

For explanation and illustration of the methods, reference should be had to the complete article.

See also

FIELD ARTILLERY—FIRE

FIELD ARTILLERY—AMMUNITION—SHRAPNEL VS. H. E. SHELL

**SIEGE ARTILLERY**

See also

FORTIFICATIONS—PERMANENT

**—Organization**

[How Can the Royal Garrison Artillery be Best Organized to Take Part in an Expeditionary Force, in the Event of it Not being Required for Coast Defense, and What Extra Training, if any, is Necessary for its Preparation for such Service? By Captain F. W. Barron; R. A. (Duncan Commended Essay, 1915.) *Jour. Royal Artillery*, Sept. '15. 4000 words.]

The subject of this essay, selected before the outbreak of the present war, has assumed a practical and perhaps vital importance. The experiences of the war all tend to alter the views of students as to the possibilities and limitations of artillery in the field.

In discussing the subject, the primary object of the R. G. A.—Coast Defense—must be kept in mind, and any changes in organization or methods of training must not detract from this primary object. Because the coast defenses have not been tested does not necessarily mean that they are no longer needed and can be neglected.

(A.)—*The rôle of the R. G. A.*

The employment of the R. G. A. in the present war may be taken as a guide to its future employment. It is found that the R. G. A. is supplying the personnel and matériel for a large number of heavy batteries and for a large and increasing number of

siege batteries; and, in addition, a large part of the personnel for divisional ammunition columns, for ammunition parks, and in some cases for brigade ammunition columns. Therefore it is necessary to find a system of organization and training which, while maintaining its efficiency for coast defense, will enable it to adopt efficiently and at short notice, any or all of the above rôles.

(B.)—*Organization*

The present organization of the R. G. A. provides for tactical units (fire commands), divided into batteries or gun groups. The strength in personnel of each company varies with the batteries manned, but for convenience of administration is fixed normally at about 150 men. There are 34 companies at home, 28 in the colonies, and 21 in India. In addition, there are at home 6 heavy (one for each division of the Expeditionary Force) and three siege batteries; and in India, six heavy and eight mountain batteries.

The experiences of the present war indicate that the number of heavy batteries for each division should be doubled, and to permit of their exercise as part of the divisional artillery at division manoeuvres, the two batteries per division should be maintained in peace.

It is impossible to say in advance the number of siege units which will be required in any future campaign. It will depend upon the necessities of the occasion. The essential point is that any peace organization adopted must be capable of expansion at will to almost any extent. The present company organization seems suitable for producing that expansion with the proviso that the matériel must be available and the personnel must be trained.

(C.)—*Training*

Since it is impossible to estimate in advance the amount of expansion required, it does not seem safe to rely, for the increased numbers, on reservists who have had service in heavy or siege batteries. Large numbers of the additional personnel must be taken from coast defense units. The ideal would be for each officer and man to be trained in either heavy or siege battery work, but this is impossible. Short periods of attachment to field units are of little value, and the time available for training in coast defense is already too short.

The best time for attaching officers and men to field units is during the maneuver and practice season during July, August, and September. The coast defense training of one-half the companies can be completed by June, which will give about 18 companies from which to select the personnel for field and siege training. There are 9 batteries to which personnel may be attached for training. It is inadvisable to overcrowd these batteries with attached personnel. As the attached personnel is intended to do duty in the battery and not to act merely as spectators, it is desirable to limit the number attached from each of the 18 available coast defense companies to one officer and 15 men. This would bring the heavy and siege batteries to about war strength, and would train each year 18 officers and 270 men. The majority of the

men selected should be n. c. o.'s, gun layers, or range-finding specialists, since it is in duties of these classes that the two services differ. To keep track of men so trained, it is suggested that the letter H or S be attached to their names as Lieut. (S) J. Jones, R. G. A.

(D.)—*Suggested Change of System*

It is further suggested that there be frequent interchange of both officers and men between the coast, heavy, and siege batteries. The interchange of a small percentage of the personnel would insure the maintenance of a number of reserves up to date in training and methods of all branches. The system of interchange might well be put into effect at the end of the present war during which so large a percentage of the coast defense personnel have had heavy siege work in the field.

(E.)—*Organization at the Depots*

To simplify the procedure at the depots in completing units to war strength, each R. G. A. depot should be organized into three sections designed to supply personnel for heavy, siege, or coast defense, respectively. As men joined the depot, they would be posted to appropriate sections depending upon their service with the colors. Thus would it be insured that company and battery commanders would get suitable and experienced men without unnecessary delay or annoyance.

(F.)—*Other Rôles Applicable to the R. G. A.*

The provision of brigade and divisional ammunition columns, which are horsed units and part of the divisional organization, naturally belongs to the R. F. A. The ammunition parks are mechanical transport units and are formed during the war as required. They include one R. A. officer and 74 rank and file "for care of ammunition." While no special training is required in the handling of ammunition, and the vehicles are operated and maintained by the Army Service Corps, additional men trained in handling motor transport would be valuable in such a unit. The R. G. A. contains many good mechanics, who could be trained easily at the R. G. A. stations where there usually are lorries and cars operated by the A. S. C. Such men should volunteer for the instruction and should be distinguished by the letter M.

(G.)—*Summing up of Conclusions*

(1) That no change tending to detract from the efficiency of the coast defense must be adopted.

(2) That the aim is to produce a reserve of officers and men trained in the duties of the various rôles which the R. G. A. may be called upon to play.

(3) That, until war breaks out, it will be impossible to say definitely what these rôles may be, or the extent of them.

(4) That, in peace, there cannot be kept up an establishment large enough to enable the R. G. A. to meet every conceivable call that may be made upon it in war.

(5) That a system must be devised whereby the peace cadres can be expanded to the needs of the moment.

(6) That this can be done without any radical change in the present organization.

**SIEGES**

See also

WATER SUPPLY—IN SIEGES

**SIGHTS**

—Machine Gun

See

MACHINE GUNS—SIGHTS

—Rifle

See also

INFANTRY—ARMS—RIFLE—SIGHTS

**SIGNALLING**

—Electrical

See also

FIELD ARTILLERY—FIRE CONTROL—INSTRUMENTS

LINE OF COMMUNICATION

TELEPHONE

WIRELESS TELEGRAPHY

—History of

[Signalling Methods Amongst the Ancients. By Comdr. Hon. Henry N. Shore, R.N. *United Service Mag.*, Nov, '15. 4500 words.]

Mentions signals by human voice (relay), carrier pigeons, by fire and smoke, as among the earliest forms, and the semaphore as a "revival" of the French Revolution. Visual power and "nauscopy,"—the faculty of far-seeing—are discussed.

—**Instruction and Training**

[The Training of Signal Men for the Artillery. By Major G. af Wetterstedt. *Artilleritidskrift*, Part 5, 1916. 4200 words.]

*Training table for the instruction of signal men in the artillery recruit schools:*

Subjects:	Hours allotted:
I. Telephone service .....	200
1. Line service .....	80
2. Station service .....	30
3. Connection with permanent system of lines.....	20
4. Instruction in the use, etc., of the telephone .....	40
5. Care of material .....	30
II. Signal service .....	280
1. Morse signalling, by sound... 120	
2. Morse signalling, by flag.... 100	
3. Morse signalling, by flashes... ..	
4. Semaphore signalling.....	60
III. Map reading .....	60
IV. Writing of orders and reports..	75
V. Transmitting orders and reports orally .....	30
VI. Instruction in general communication service .....	20
VII. Training in the use of fire direction instruments; etc.....	10
VIII. Fortification and obstruction work .....	15
IX. Pistol firing.....	20
X. First aid and sanitation instruction .....	20
XI. Application instruction .....	100
Total special training.....	830
XII. General military training.....	450
	<hr/> 1280

**SIGNALLING—Continued**

(The author describes in detail what is included under each of the above headings, and the degree of importance of each subject. Also what kind of men should be selected to take this instruction and what other military work they should be excused from.)

**—Visual**

See also

SEMAPHORES

SMOKE SIGNALS

**—Visual—By Illumination**

See also

SEARCHLIGHT

**SITOGONIOMETER**

See

FIELD ARTILLERY—FIRE CONTROL—INSTRUMENTS

**SKETCHING**

[Sketches. Considerations Concerning their Importance and the Manner of Constructing Them. By Lieut. Col. A. R. Moreno. *Rev. del Circulo Militar*. Oct '15. 1500 words. 2 figures.]

The first requirement is to know how to orient oneself in any terrain and at any hour, employing one of the various existing methods. This is the fundamental basis of operations. In addition to this, sketching should be practised continually.

The sketch is the complement of the reconnaissance. It is an indispensable auxiliary because of the fidelity of its representation facilitating the proper disposition of the forces at strategic points.

The greater or lesser precision of the sketch varies directly with the time available. If a map of the region is available, the first thing is to orient the sketch paper with regard to the terrain and the situation. Next are traced the general features, important roads, railroads, streams, and notable accidents of the terrain which serve as points of orientation and reference. Also heights which may give a general idea of the ground. Troops are represented by signs at the precise points where encountered. Accidents of topography are represented by conventional signs or in colors, a key being given in the margin. In any case the base is the given map.

When no map is available, it is necessary to make one by reconnoitering the terrain, observing the same system as before.

Sketches may be made with a black pencil, but the clarity of one expressed in colors is greater. The latter gives at a glance the required object: the general lie of the terrain and the location of the troops.

Sketches being the simplest of topographical works, great care must be taken to the end that this very simplicity may not result in oversights with grave results.

**—Instruments and Equipment**

[Cavalry Sketching Case. By J. D. Fernández, Capt. of Artillery. *Mem. de Artilleria* (Spain), Jan, '16. 2700 words. 5 figures.]

This consists essentially of a flat box of aluminum and white metal. The top of the box serves as a sketching board. The bottom is hinged in two sections to permit access to the paper rolls inside. The paper passes from one roll through a slot, across the sketching board and is wound upon the other roll. The board is laid off in small squares. A T-square and swinging rule are provided. The rule may also be used as a clinometer, graduations being made on the rim of the board for this purpose. Brackets are provided for carrying a compass and a pedometer. The weight of the case is 890 grams.

**—Panoramic**

[Hints on Panoramic Sketching. By E. J. McKaig, R. E. *Royal Engineers' Jour.*, Dec, '15. 1000 words. 4 figs.]

This article is intended to give the unskilled sketcher assistance in producing a drawing that shall give an accurate idea of a landscape. The success of such a sketch depends largely upon the artist's ability to put down the relative proportions of distance, middle distance, and foreground. With a little practice in observing, almost any scene can be readily divided into three such layers or lines; the usual trouble with the beginner is that he sees *too much*, a too complicated whole.

It is suggested that the amateur begin by using sheets of standard proportions ruled with faint lines, two horizontal and one vertical. A "picture finder" is then prepared, with an aperture of similar proportions, and stretched threads corresponding to the lines in the paper. The panorama to be drawn is studied through the finder, the positions of the salient lines noted, and their transfer to the paper becomes a mechanical matter.

It is a comparatively simple problem to fill in the remaining detail, care being taken to vary the strength of line, from a very fine line for the horizon to a heavy line for the foreground.

**—Plane-Table Triangulation**

[Plane-Table Triangulation from One Station Only. By E. A. Reeves (Map Curator and Instructor in Surveying, Royal Geographical Society). *Jour. Royal Artillery*, Oct, '15. 4000 words. 8 diagrs. (From the *Geographical Journal* for May, 1915, with additions and alterations.)]

A description is given of an attachment devised by the author and fitted to a plane-table alidade, for rapid graphic triangulation and fixing the distance of points, from one station only.

The attachment is of value in rough and difficult country, and for locating quickly and with a fair degree of accuracy, additional points not shown on an existing map. The alidade fitted with this attachment is not limited to short distances, but can be used for any distance within the range of clear vision, provided the operation is carried out with suitable triangles and altitudes.

The telescope of a plane-table alidade, with an arc to measure vertical angles, is fitted with a long, light frame, carrying two or any suitable number of horizontal wires, all parallel

to one another, parallel to the optical axis of the telescope, and to the fiducial edge of the alidade when the instrument is leveled and pointing in the direction of the horizon line.

To use the device: When fixed points previously have been laid down, one of these, as (B), can be selected and its distance from (A), the station of the surveyor, can be measured off by the scale. But if no such points are available, the distance (AB), which is to serve as the baseline, must be measured by the distance finder alidade or other suitable instrument. The baseline is then plotted on the plane table. To locate any other point, as (C), a sight is taken from station A in the usual manner. The vertical angle subtended by C from B is set off on the vertical arc of the alidade, and the alidade, kept truly level, is placed over station B on the plane table and turned horizontally until the tops of the two distant points, B and C, are seen to coincide with one of the long horizontal wires or to lie in a line parallel to those wires. The alidade then is parallel to the line joining the two points B and C, and the line BC can be plotted on the plane table.

The baseline should be so selected that the distances AC and BC are not sensibly different; the side AC should be four or five times the length of the baseline AB; and the angle subtended by C from B should be as large as possible, to give a good inclination to the wire attachment, as the method fails entirely when this inclination is 0°. The two stations of the baseline should be practically on the same level, but the vertical angle of B from A should never exceed 1°, either elevation or depression.

It is important that the instrument be in proper adjustment so that true angles of elevation and depression are measured, and that the wire attachment is horizontal and the wires parallel to each other, when the telescope is set at 0° and the alidade leveled.

## SMALL ARMS

See

### INFANTRY—ARMS—RIFLE

#### —Anti-Aircraft Firing

[Firing at Aircraft with Rifles, Automatic Rifles and Machine Guns. By Capt. V. Bisgaard and First Lieut. Raabye. *Dansk Artilleri Tidsskrift*. Jan, '16. 5000 words.]

While there seems to be unanimity of opinion that musketry-fire should as a rule be opened against airships when within range, doubt has hitherto been held as to whether it would be expedient to use small-arms fire against aeroplanes, and the following reasons for not doing so are given:

1. The difficulty of distinguishing between the enemy's and friendly airmen.
2. The risk of hitting friendly troops.
3. The small probability of hitting owing to smallness and speed of the target.
4. Opening fire reveals the position of the troops and thereby assists the enemy's air pilots.

Objections 2 and 4 also hold good for airships. It is a fact, however, that when the op-

portunity has been offered rifle fire has almost always been opened against aeroplanes. The reason for this is that the bringing down of the pilot is of enough importance to justify a considerable expenditure of ammunition. Data from recent wars indicate that the probability of hitting with the rifle is 1-10 to 1-20 of one per cent., i. e., from 500 to 1000 cartridges must be expended for one hit. Even if the results obtained are negative there is a moral effect from the fire and it also forces the pilot to remain at high altitudes.

The most practical method of attacking aircraft with small-arms is that developed at the Austrian Musketry-School (*Mitteilungen der k. u. k. Armeeschule, 2d Quarter, 1913*) after having been proposed by Major S. Renard, commanding the school of fire at the camp of Ruchard, published in the *Journal des Sciences Militaires*, no. 97. (*Note sur le tir de l'infanterie contre les objectifs aériens*).

The principle of this method is that the several groups firing should use different sight settings. This makes range firing unnecessary and requires no repeated changes in sight setting. It increases the probability of hitting a target which is rapidly changing in range and one which is within range for only a short time. It is this method which has been studied in detail by the authors and applied to the Danish rifle (8mm. Krag Jørgensen, M. 1889, with 1908 ammunition).

(Then follows a technical discussion of the trajectories at different aiming angles, and of the danger spheres in the air when different sight settings are used, covering twelve pages with numerous diagrams.)

Simple rules for conduct of fire are necessary. If airships come near large bodies of troops in column certain companies should be designated to leave the column and open the fire attack. The formation in which the troops are held during firing is not important. Fire should be opened as soon as the aiming angle is 45 degrees. Magazine fire is not recommended, as the sight settings are usually great, and aiming should be deliberate.

Airships and aeroplanes are very important targets and should always be fired at except in the following cases:

1. The firing unit should not be less than a platoon, unless special orders have been given. This places the tactical decision and the control of the fire in the hands of a commander who has more or less tactical and technical knowledge. It is pointed out that detached posts, sentinels or patrols will have to open fire without waiting for orders when the target is within short range.
2. Fire should not be opened by troops already engaged, it being the duty of the reserves to attack aeroplanes in all cases except when it is important that they should not reveal their position.
3. Troops hidden from the aeroplane should as a rule not fire. This applies at night and when the troops are in woods or in cantonment.
4. When it is known that the airship is flying at a height greater than 2000 m., or the aero-

**SMALL ARMS—Continued**

plane higher than 1500 m., or when the horizontal distance is more than 1500 m.

5. Fire in the direction of friendly troops will endanger these troops if they are within 3600 m. of the firing units.

6. If the commander has any doubt as to whether the aircraft is friendly or hostile.

The following rules for fire direction, based purely upon theoretical conditions are given: At airships known to be within effective range, use two sight settings of 1000 and 1600. Aim at front of ship. Open fire when aiming angle is 45 degrees. Cease fire at same angle. When the airship is known to be at distant range use sight settings 1400 and 1600.

At aeroplanes within effective range use sight settings 1800 and 2000. Aim at front of target. Open fire when target is at an angle of 45 degrees. Cease firing when target is at the zenith or about 30 degrees therefrom. When an aeroplane is at distant range and the strength of firing unit is 100 rifles or less, use sight settings 1600 and 2000; if from 100 to 200 rifles are in the firing units, use 1400, 1600, 1800 and 2000, and aim ahead of target.

If an airship is coming very low, use battle sight. If an airship is circling over troops, use sight setting 800 and 1000.

**SMOKE SIGNALS**

[Smoke Producing Rockets. *La Guerra y su Preparación*, May, '16. 100 words.]

The experience of the war has shown the necessity of accurately knowing the position of the most advanced assaulting troops. The same necessity exists on the side of the defense. It is only thus that orders may be given with exact knowledge of the situation of the combat, so as to extend the fire and to assist the advance and at the same time to prevent firing upon one's own infantry. With this object in view, smoke-producing rockets have been issued to attacking troops. These produce easily visible signals which indicate, without the slightest confusion, the line occupied by the most advanced elements.

**SOMME, Battle of the**

[The War on Land. By a Military Officer. *Army & Navy Gazette*, July 29, '16. 2500 words.]

A critical time is arriving in the offensive on the western front. In the first six days of July the Allied air service had been so preponderant that the Germans, even if they knew of the impending attack, must have been in doubt as to the distribution of weight. After that phase, the Germans might still be in doubt as to whether adequate means had been assembled for a prolonged offensive.

But now that the second line has been pierced, there can be no longer any doubt and the question is whether the Germans can make themselves strong enough to keep back the Allied attack. An attack that gains ground slowly and at great cost is a failure. Slow progress precludes breaking the enemy's cohesion, and the loss is too great if it is greater than that of the enemy. The Germans are fighting with great tenacity.

[The Battle of the Somme. By J. B. Gau-treau, French Correspondent. *Army & Navy Journal*, Aug 26, '16. 900 words.]

The Franco-British attack differs from the previous offensive attempts and is expected to yield substantial results. Superiority in guns and munitions, in numbers and in morale, is now with the Allies. Yet this superiority does not lead to waste. The attacking infantry makes no headlong attacks where preparation has been inadequate. If parts of the defenses have escaped destruction in the bombardment, a halt is made until this condition is remedied.

The prestige of the bayonet had suffered by the multiplication of machine guns. It is now being revived. Only an infantry thoroughly practiced in hand-to-hand work can hope to retain the results of superior artillery fire. Bayonet fencing must receive first consideration in infantry training. The French have always believed in the bayonet and the Russians to only a slightly less extent. Gen. Pétain shares this view and encourages the formation of attacking units made up of picked men especially trained.

[The Nature of the Somme Offensive. By Hilaire Belloc. *Land and Water*, 24 Aug, '16. 2200 words.]

The first stroke of the Somme offensive resulted in the gain of a wide belt of territory. The second stroke gained a belt much narrower than the first. Since that date, now five weeks past, the movement on the map, though continuous, has been slight. What do such tactics mean? The answer to that question is exactly the same as the answer to similar questions that might be asked about the Italian front, the Galician, the Volhynian and the new pressure in front of Salonika. The Teuton is at a disadvantage now in every one of the factors that make for final success in war, and he will be at an increasing disadvantage progressively as time proceeds. He is at a disadvantage numerically, he is at a disadvantage in the quality of the men he can call up as drafts. He is at a disadvantage in munitionment and in civilian maintenance in all necessities. He is strategically at a disadvantage, for the Allied superiority has now given them the initiative. Under such circumstances the whole plan of the Allies is a united, consistent and increasing pressure.

Local pressure has a decided general effect in that it produces weakness at other places. For example, the Teutons have had the equivalent of 30 or more divisions before us on the West in the last nine weeks. Only 11 German divisions were found available to meet the Russian pressure in the East. In the absence of the Somme offensive, the German divisions sent south to help the Austrians would have been perhaps 26 instead of 11. Likewise, the Italian pressure upon the Isonzo front was felt upon the Austrian front in the north and was an integral factor in Brussilov's success, just as Brussilov's pressure was a factor in the Italian success, and in ours. There is no analogy between the Somme offensive and that of the



Germans against Verdun. The latter was an experiment on the part of the German higher command which will prove the turning-point of the later war. The Somme offensive was not an experiment, but a plan deliberately undertaken which has been conducted with continuous success. It marks the entry of the Allies into the last phase of the war.

[Combles. By Hilaire Belloc. *Land and Water*, 28 Sept, '16. 450 words. 1 sketch.]

The Somme offensive affords no material for further analysis at present. The rate of progress remains normal. The Allied command of the air permits the most accurate artillery observation. Combles has been almost completely isolated. The Teuton slowness in counter-attacking lately has been very pronounced.

[The Somme Offensive. By Hilaire Belloc. *Land and Water*, 7 Sept, '16. 1600 words.]

The object of the Allied offensive on the Somme front is to maintain an *unbroken superior pressure* upon a certain chosen sector at such a high "potential" that the Germans shall be compelled to concentrate here a large portion of his available effectives; that the perpetual necessity of resting and replacing men under such a strain shall exhaust their numbers, and that they shall be prevented altogether, or seriously hampered in their attempt, which must come sooner or later, to save diminishing resources by a retirement that would shorten the line. On Monday, July 31, the first month of the offensive ended. Over and above the initial captures of the first ten days (some 7000 *unwounded* prisoners) about 4000 *unwounded* prisoners were captured during this month.

The daily work of August on the Somme front shows almost exactly the same curve as that which marked the preceding month after the initial capture of the first line. By Aug 31 nearly 10,000 prisoners were in the hands of the British alone. During the first four days of September, over 1000 *unwounded* prisoners have been captured.

The test of prisoners taken is an imperfect one, as the artillery fire and first line fighting account for much heavier losses to the Germans, but it is significant in that it proves the regularity, the persistence and the success of all but one of now *eight* intensive sectors of effort that are deciding the war.

[The New Success on the Somme. The Bulgarian Position. The Salonika Offensive. By Hilaire Belloc. *Land and Water*, 21 Sept, '16. 5000 words. 3 sketches. One illustration.]

The appearance of a new tactical instrument, the heavy armored cars, has added greatly to the interest of the late news from the front. The taking of over 4000 prisoners and the occupation of a very considerable belt of territory has given last week's operation between the Combles Valley and Thiepval the character of a decided and victorious blow. Its author has justly characterized it as the

heaviest stroke yet delivered by the British Army. Three technical points to be noted are the superiority in air work, the superior accuracy of artillery fire and the wholly novel and successful experiment of the armored cars. Perhaps more remarkable than the originality of the new instrument of war is the discipline which has kept it secret during all the months of construction. Not a word of the instrument leaked out in advance to the Germans. Its offensive upon the battlefield was a complete surprise. Something very appreciable to all commands, French, British and German, upon this memorable and perhaps decisive field, is what may be called "the curve of morale." It is clear that confidence and determination are rising upon the offensive side with progressing rapidity; it is equally clear that with less rapidity, but in a manner no less certain, those factors are failing on the side of the defense.

#### *The Bulgarian Position*

This position has been treated too much, perhaps, as a secondary and independent theater of war. The success or failure of the Bulgarian Army in the next few weeks will affect the character of the war for many months to come. It will particularly affect the *rate* of the Teuton's defeat. This is on account of two great factors; the first is the Dardanelles, the second is the war of movement. If the Bulgarian armies permit the Allied forces to meet upon their territory, the Turkish armies are isolated from the Central Powers. This would now mean the fall of Constantinople. On this count the defeat of the Bulgarian Army is vital to the campaign as a whole. The moment the issue to the Black Sea is in control of the Allies, the economic position of Russia, and, what is far more important, the power of rapidly and continuously munitioning and arming Russia, will be changed enormously in the Allied favor.

A war of movement is still impossible in the West and upon the Italian frontier and even upon the Eastern frontier from the Carpathians to the Baltic, because the Teutons still are able to maintain a sufficient number of effectives to compel siege conditions. This state of affairs will last until his line breaks somewhere. There was a moment in the early summer when it looked as though a true war of movement could be restored on the Eastern front through the destruction of the Austrian armies between the Rumanian frontier and the Pripet Marshes, but just enough forces were brought up to re-establish equilibrium for a time at least. A defeat of Bulgaria by the Allies before the close of the present season would restore the war of movement upon one sector of the great ring. When such a war of movement begins, it will spread like fire in dry grass along the lines to the right and left. Conversely, if Bulgaria maintains her position and can keep either opponent at arm's length to the north and to the south, the present position endures in the East for some months to come. The Bulgarian commanders under their German commander-in-chief are occupied in keeping within bounds a threat from the

**SOMME, Battle of the—Continued**

north and a threat from the south. The plan adopted is now quite clear. Of the original ten or twelve divisions drawn up to watch the mixed army of Sarraill, the greater part were left stretched out from in front of Monastir to the line of the Struma. Their mission was to receive the shock of Allied offensive based on Salonika and to hold firm. For this purpose the greater part of the whole Bulgarian Army was needed, but a considerable proportion was detached for the simultaneous effort to be made in the north. This fragment was, just before Rumania made war, five divisions strong, of which four were the full Bulgarian divisions—50 per cent. larger than the British—and the fifth a mixed division partly Bulgarian, apparently, and partly Austrian. In the first days of the war with Rumania, these divisions had swelled to at least seven; Turkish troops were present and probably another division had been withdrawn from the south. The talk about numerous German troops being added to the Bulgarians here is very doubtful. There are certainly a large proportion of German and Austrian heavy pieces, for that is the arm upon which the Teuton universally depends; his whole theory of action to advance now depends upon it. There is a considerable proportion of German officers present and it is said that the higher command is wholly German, but the mass of the infantry is Bulgarian. The work consists in clearing the Dobrudja and reaching the great Cernavoda Bridge. If they hold that bridge and compel its destruction by the retiring Rumanian Army, all chance of the Allies meeting on Bulgarian soil is, for the season, at an end. Had the Rumanians stood strongly on the defensive along the passes of the Carpathians and used in conjunction with the Russians the unique opportunity which the Cernavoda Bridge gives of turning the Danube obstacle, there might have been a very different story to tell. For reasons of which we know nothing, but which no doubt were sufficient to convince the higher commands of the Allies, that course was not pursued. From two to four Rumanian divisions were entrusted with the duty of holding the Dobrudja, that is, a perfectly open line 100 miles in extent. In other words, a numerically inferior force suffering further from inferiority in the caliber of its guns, their number and munitionment, had to meet the blow of the rapidly increased Bulgarian force under German command which was advancing against it. What followed was that the main part of the Rumanian forces on the extreme south of Dobrudja were shut up in Turtukai, cut off from the north and pressed back upon the river. The equivalent of a Rumanian division disappeared, and the remainder of their forces fell back northward. Silistria was abandoned and the next shock was taken upon a line about 20 miles down the Danube from that point. The battle which lasted about two days terminated in the retreat of the Rumanians and the Russians on Sept 14. The real decision will come farther

north upon the prepared line to which the Russo-Rumanian forces have retired.

**The Salonika Offensive**

[A necessarily imperfect description of the Allied advance against Monastir is given. (At the request of the Press Bureau a considerable portion of Mr. Belloc's article was held back. This interferes with the main argument.—EDITOR.)]

See also

FRANCE—MILITARY TOPOGRAPHY OF  
(Article: "The Offensive in the West")

**SOUTH AMERICAN WARS FOR INDEPENDENCE**

See

PICHINCHA, BATTLE OF

**SPAIN**

—Aeronautics—Dirigibles

See

DIRIGIBLES—SPAIN

—Army—Artillery

See also

FIELD ARTILLERY—ORGANIZATION—SPAIN  
MUSEUMS, MILITARY—OF ARTILLERY—  
SPAIN

—Army—Cavalry

See also

CAVALRY—INSTRUCTION AND TRAINING  
(Article: "The Cavalry School of Fire")

—Army and Navy

[Chronicle of the Spanish Army. The Conferences Between the Army and the Navy. By V. J. Caesar. *Revista Militar* (Portugal), June, '16. 6000 words.]

This year's conferences between the Army and the Navy have been very interesting and instructive for all concerned.

The program is as follows: 1, study of the Modern Battle, and especially the frontal attack and the turning movement; 2, co-operation of the arms and their tactical application to a modern battle field; 3, recruitment, instruction, promotion and recompense of officers for the instruction of reserves; 4, the body of the train in the principal foreign armies; 5, the problem of munitions, production, consumption, and the service of replacement; 6, heavy artillery in violent combat; 7, naval aeronautics, fortifications and mine warfare; 8, submarines and submarine mines in modern naval warfare; 9, food supply for armies in the field; 10, hygiene of quarters and camp and the sanitary service in actual war.

Different officers presided at the conferences; usually an officer who was proficient in any one of the subjects to be considered presided while that particular subject was under consideration.

II. The Contingent of 1915.—The number of recruits incorporated in January was 55,611. The effective strength of the standing army for 1916 was fixed at 140,760 men, but the Minister of War is authorized to augment this force during certain seasons of the year.

The effective force of the Navy was fixed at 11,227 and the Marine Corps at 4160.

III. Naval Bases for Submarines.—The Radio Telegraph and Telephone.—Spain has three organized Naval Bases for submarines, viz.: Marin, Tortosa and Mahón. Spain is having some submarines constructed in the United States and some built in home arsenals. Marin is also a base for hydro aeroplanes.

The base at Mahón comprises six submarines, three destroyers, six torpedo boats, one cruiser, necessary supply boats and launches.

The radio stations are located at Almería, Carabancha, Barcelona, Valencia, Bilbao, Corunne, Guadalajara, Mahón, Melilla, Cueta, Larache and Tetuan.

IV. Examinations for the naval engineers and officers of naval artillery.

V. Practical application and voyages of instruction of the graduates of the Superior School of War and the Military Academies.

VI. Admission to the superior school of war and the military academies.

VII. General officers. The standing army is comprised of two captains general, thirty lieutenant generals, fifty-nine generals of division, and one hundred and twenty generals of brigade.

The reserve is composed of eleven lieutenant generals, forty-six generals of division, and one hundred and twenty-six generals of brigade. Total, 414 generals.

VIII. Exercises. The Spanish army is maintaining great activity in field exercises and target practice.

IX. Military Preparatory Schools. There are 223 military schools in Spain, 98 of them devoted to special work. There are numerous societies of boy scouts also.

X. Suppression of the publication, *Foreign Military Information*, and the substitution therefor of the official publication *The War and Its Preparation*.

#### —Army—Organization

[Project of the Organic Military Law. (Continuation.) Read by the Minister of War in the Congress of Deputies on Oct 24, 1913. *Revista de Caballería*, June, '16. 6300 words.]

The 64 infantry battalions are formed into groups of eight battalions each. In time of peace each group is under the inspection of a general of division. Upon mobilization each group, with the corresponding auxiliary troops, forms a division. The division is subdivided into two brigades of four battalions each.

#### Artillery

The first line artillery units consist of 11 regiments of 75 mm. field artillery, one regiment of 75 mm. horse artillery, one regiment of heavy field artillery (three batteries 12 cm., and three batteries 15 cm.), one regiment of siege artillery, six commands of fortress artillery and eight artillery parks.

The scheme provides for depot groups for each regiment and for the expansion of the

field artillery upon mobilization into a sufficient number of units properly to equip the reserve divisions.

#### Cavalry

The first line cavalry troops of the Peninsula are organized into eight regiments of lancers, two regiments of hussars, and 12 regiments of *casadores* (Chasseurs). The regiments (excepting the last four regiments of *casadores*) consist of four squadrons, with a minimum of 110 men per squadron, and a depot squadron. The last four regiments of *casadores* have six squadrons and a depot squadron each. The lancer and hussar regiments each have a machine gun section of two guns.

The first eight regiments of *casadores* pertain to the eight permanent first line divisions as divisional cavalry. The remaining four regiments of *casadores*, the six lancer regiments, and the two hussar regiments form two cavalry divisions of three brigades each.

The *casadores* regiments form the third brigades and upon mobilization are formed into eight groups of three squadrons each, constituting the divisional cavalry of the eight reserve divisions.

Each cavalry division has three batteries of horse artillery. For administration and training in time of peace the six batteries of the two divisions are formed into one regiment.

#### Complementary Dispositions

Articles 80 to 90 inclusive refer to the distribution of the units in the respective regions, the selection of commissioned personnel of the various arms for duties with the special services, the organization of supply columns and bakery companies and the detail of officers from the reserve to command them, and to other administrative details. Article 88 requires quantities of clothing and equipment sufficient to provide for *war strength units* to be kept in the store rooms of the various organizations.

#### Engineers

The first line engineer troops consist of two sapper regiments, two telegraph regiments, one railroad regiment, one pontoon regiment, one company of mechanics, and aeronautical troops.

The organization of each unit and plan for expansion upon mobilization are given in detail.

#### Sanitary Troops

The sanitary troops consist of eight companies, one to each military district; two field hospitals, one to each cavalry division; and a depot. The necessary expansion to equip the reserve divisions is provided for.

#### Special Services

The first line special service units are: five remount establishments for cavalry and one for artillery; seven stud depots; one breeding farm; the Topographical Brigade of the General Staff; the Orderly Section of the Minister of War; detachments at the Central School of Fire, the War College, School of Equitation and the Military Academy; The Military Penitentiary of Mahón.

**SPAIN—Continued***Supply Troops*

The first line supply troops are organized in eight commands which are assigned to the eight military districts into which the Peninsula is divided.

A command consists of one active or permanent company, one reserve company and one depot. Provision is made for expansion upon mobilization.

*The Second Line Army*

This is formed by eight reserve divisions, one from each military district, an independent brigade of cavalry, and various auxiliary units and special services. The infantry troops of the eight divisions consist of 116 battalions of four companies each, one battalion from each of the 116 recruiting districts.

The divisions have two infantry brigades, the brigades have from four to eight battalions each.

The permanent commissioned personnel of a reserve battalion consists of one major and three captains of the active list. They are responsible for the administration of the four companies in time of peace. Upon mobilization the major commands the battalion and the captains command the first three companies, a captain from the reserve commands the fourth company. Should the number of men in a reserve battalion at any time exceed 1500 men, a second battalion is formed. The first battalion is then organized as a first line battalion, is commanded by the regular officers and is called the *mobile battalion*. The second battalion is commanded by officers of the reserve and is called the *garrison battalion*.

It is used for service in the line of communications and as a depot battalion.

There are ten reserve regiments of cavalry and eight reserve regiments of mobile artillery.

(To be continued.)

**—History**

See also

EUROPEAN WAR—RELATIONS WITH NEUTRALS—SPAIN

**—Munitions—Manufacturing Facilities**

See

MUNITIONS—MANUFACTURING FACILITIES OF—SPAIN

**SPIES AND SPYING**

See

ESPIONAGE

**STAFF**

[Composition of Headquarters of Brigades, Divisions and Corps, in Peace and in War, of the Principal Armies. Reported by Military Attachés from the Countries Considered. *La Guerra y su Preparación* (Madrid), July, '16. 3000 words.]

See also

EUROPEAN WAR—STAFF QUESTIONS  
GREAT BRITAIN—ARMY—STAFF

*Germany*

A *Generalkommando* (army corps headquarters) in time of peace, is composed as follows:

(a) Chief of staff;

(b) Section I (field or campaign), two or three officers of the General staff, charged with the following duties:

Officer Ia. Troop exercises, maneuvers and marches. Quartering of troops.

Officer Ib. Mobilization. Regulations of the different arms. Organization.

(c) Section II. Adjutantur. Two or three officers of the adjutantur, who have the following duties:

Adjutantur IIa. Personnel

Adjutantur IIb. Interior service. Re-enlistments. Uniforms. Remounts.

Adjutantur IIc. (Officer not on the active list.) *Beurlaubstandes*.

(d) Section III. Military Law. Courts martial. (Two or three judge advocates.)

(e) Section IV. Administration. Sanitary and Veterinary services. Religion. The section includes:

Section IVa. Quartermaster duties (under a Corps Quartermaster), i. e.,

1. Pay.

2. Rations and Forage. Inspection of commissary store houses, bakeries, etc.

3. Clothing. Inspection of clothing depots.

4. Military buildings, and garrison equipage.

5. Administration of lazarets.

Section IVb. Sanitary service, under a chief medical officer (*Generalarzt*).

Section IVc. Religion, under an upper chaplain (*Militaroberpfarrer*).

Section IVd. Veterinary service, under a chief veterinary officer (*Korpsstabveterinar*).

In time of war the composition of corps headquarters is as follows:

(a) Chief of staff.

(b) Section I (field).

Officer Ia. Operations, marches.

Officer Ib. Quarters. Ration supply.

Security of lines of communication.

Officer Ic. Communication (aviation, telegraphy, telephones, etc.)

Officers Id. Assistant to Ia.

(c) Section II (Adjutantur). Three officers (IIa, IIb, IIc).

(d) Section III. Military Justice and Courts Martial.

(e) Section IV. Is subdivided into:

IVa. Quartermaster duties.

IVb. Sanitary service.

IVc. Veterinary service.

The following also form part of the *Generalkommando*: the chiefs of pioneers, train, and artillery, respectively; the commanding officer of the headquarter troops, the commanding officer of the cavalry escort; the chief of the post office service; and the headquarter paymaster. To these may be added the officers of the volunteer automobile corps, in variable numbers, and the commanding officer of the *feld-gendarmerie* (provost-guard). The number of officers may thus be as great as 68, of whom the only general staff officers are those of Section I.

As a matter of fact, the composition of corps headquarters varies, because the great units do not always have the same elements. For example—the XXI corps had:

1—Chief of Staff, Major of the General Staff.

Officer Ia, Major of the General Staff.

Officer Ib, Captain of the General Staff.

Officer Ic, Lieutenant of Cavalry.

1st Officer of Adjutantur, Captain of Cavalry.

Commanding officer of Corps Headquarters, Captain of Cavalry.

In all, there were 12 officers, of whom three belonged to the General Staff. On the other hand the XXXIX Reserve Corps had 23 officers, three of the General Staff.

Division headquarters are for reasons similar to the foregoing, very variable. In the 77th Reserve Division, which may be taken as typical, there were:—

A Chief of Staff, Major of the General Staff.

1st Adjutantur, Captain of Artillery.

2nd Adjutantur, Lieutenant of Cavalry.

1—Assistant (for orders), Lieutenant of Cavalry.

Commanding officer, headquarter troops, Lieutenant of Cavalry.

Medical officer of the Division, with one assistant.

Division Quartermaster.

Judge-Advocate.

This number, nine, maybe regarded as the general rule. If possible, the Division Chief of Staff is a major or captain of the General Staff. Brigade headquarters have:

1 Adjutantur, Captain of Infantry, Cavalry, etc.

1 Orderly officer, Captain of Infantry, Cavalry, etc., to whom must be added in the majority of cases, a Chaplain.

### Bulgaria

In time of peace, the national territory is divided into three inspection districts, each commanded by a lieutenant-general. The army consists of 40 three-battalion regiments of infantry; 44 squadrons of cavalry; 90 field, 20 mountain, 12 howitzer, 12 fortress batteries of artillery; five six-company battalions of scouts; six railway, four telegraph, four pontonier, four technical, ten quartermaster, and ten sanitary companies. The ten divisions, with one cavalry division, formed of these units are practically independent of one another. On mobilization, armies are formed without respect to their former territorial grouping.

The division is commanded by a general of brigade (the grade of general of division does not exist), assisted by one colonel of the general staff; one lieutenant-colonel, judge-advocate; one major of the Q. M. Department; one archivist (civilian), and one watchman (civilian). The administrative staff consists of three officers (lieutenant-colonel, major, and captain); and of the following civilians: one treasurer, three clerks, three bakers. Various non-commissioned officers (Q. M. D. and Sanitary), are attached.

A brigade is commanded by a general or by a colonel, who is assisted by a staff captain, a lieutenant-colonel, in charge of recruiting,

and four lieutenant-colonels of the reserve, commanding the battalion parks.

There is besides an inspector-general's department, headed by a lieutenant-general, to whom are assigned a colonel and two majors of the general staff, two judge-advocates, and one colonel of artillery. As the latter's functions are purely advisory, the office will be suppressed, and its duties turned over to one of the colonels of the divisional artillery.

When war breaks out, the infantry regiments expand to three battalions, and the divisions to three brigades, the batteries double their number, so as to furnish each division two regiments. The other arms and services likewise increase as far as the available material, etc., permits. Two or more armies are then formed, according to the necessities of the campaign.

The various headquarters are then composed as follows:

(a) *Brigade*: 1 lieutenant-colonel or major of the General Staff; 1 judge advocate; 2 lieutenants of the line, one to assist the Chief of Staff, the other to act as a d. c. General officers are not allowed a. d. c.'s as such.

(b) *Division*: 1 colonel, 1 major and 2 captains of the General Staff; 2 judge advocates; one Chief Sanitary Officer (lieutenant-colonel); 2 Q. M. majors; 1 lieutenant, acting as a. d. c.; 1 platoon of foot, and 1 section of mounted gendarmes; and the necessary personnel of the mail and telegraph service.

(c) *Army*: 2 colonels, 2 majors and 5 captains of the General Staff; 1 major of infantry, commanding headquarters; 1 colonel of artillery, in general command of the artillery; 1 lieutenant colonel of artillery, in charge of ammunition supply, assisted by 1 captain; 1 colonel of engineers, assisted by 1 captain, who, in addition to his other duties, has charge of the headquarter automobiles; 1 colonel judge advocate; 1 colonel, Medical Staff, with two assistants, one of whom is a dentist.

The officers of the line-of-communication service are rated with Army Headquarters. They are: 1 general of brigade commanding; 1 colonel and 2 captains of the General Staff; 1 colonel, assisted by 2 lieutenants, in charge of the transport; 1 colonel, 2 lieutenant-colonels, 4 majors and 2 assistants of the Q. M. D.; a sanitary subinspector with 3 officers of the Corps, who assist the chief, evacuate the wounded, and have charge of pharmacy work, respectively. There are besides, 1 company of foot, 1 squadron of mounted gendarmes; 1 cyclist company, 1 telegraph; 1 engineer park.

[The article then goes on to describe in some detail the judge-advocate work of the Bulgarian Army. The officers of the corps are officers of the army, who before entering the Military Academy, or after graduation, have practiced as advocates. There is only one officer of the corps at each headquarters.

**STAFF—Continued**

The procedure of military jurisprudence is exceedingly simple, so that punishment follows without loss of time on the heels of sentence, thus strengthening the force of example.]

*France*

The experience of the war shows that headquarter staffs gain in efficiency if the officers composing them have exercised command in their respective grades. Among officers that have not passed the Staff College, the selection of those who have had experience in a troop unit, or who have made a personal study of the subject, has obtained good results. Hence:

Officers of Corps Staffs will be taken from those who have exercised command in their respective grades; other things equal, officers that have been wounded will be selected.

The higher officers of each Corps Staff, the Chiefs of each Division Staff, will as far as possible, be taken from those graduates of the War College that have commanded a company (squadron or battery), battalion or artillery group.

Officers not graduates of the War College, before selection, must have commanded during the war a unit of their grade, and have, before the war, made a study of staff service. Wounded officers, unfit to serve with their units, are preferred. In general, are considered best fitted for staff duty:

- (a) Officers of all arms admitted to the War College in 1914;
- (b) Officers of cavalry, graduates of the lieutenants' course at Saumur in the immediate past;
- (c) Officers of artillery, who have seen active services, and who thoroughly understand the munition and matériel supply service.

*Great Britain*

No special principle seems to govern the constitution of the various headquarter staffs. The brigade has a chief of staff, and a considerable number of n. c. o. and men. These last are charged with telephone, police and supply service. The Division has 3 General Staff officers; an A. A. G., and A. Q. M. G.; a D. A. A. G. and a D. Q. M. G.; 2 R. A. M. C. officers; an ordnance officer; 4 automobile officers; 2 veterinarians; and a large number of n. c. o., and men for transport and other duties.

The composition of corps and army headquarters varies exceedingly, and is constantly changing, according to necessities and the opinion of commanding generals.

*Italy*

Army corps, both in peace and in war:

1 Chief of Staff, colonel of the General Staff; 1 lieutenant-colonel or major of the General Staff; 1 or 2 captains of the General Staff; 2 captains, *applicati*;<sup>\*</sup> 1 lieutenant of

cavalry or infantry, a. d. c.; 1 veterinary lieutenant-colonel or major; 1 lieutenant-colonel, major or captain, of mounted troops (drawn from the auxiliary service, and in charge of the auxiliary military train); 4 civilian officials; 2 line n. c. o.

Division: 1 lieutenant-colonel or major of the General Staff; Chief of Staff; 1 or 2 captains of the General Staff; 1 or 2 captains, *applicati*; 1 veterinary major, captain or lieutenant; 3 or 4 civilian officials; 3 n. c. o.

Brigade: 1 captain of infantry, assistant to commanding general; 1 n. c. o.

*See also*

GERMANY—ARMY—STAFF

**STAFF COLLEGES****—Portugal**

[The Military College. By Carlos Elias da Costa Jr., Captain of Artillery and Professor in the Military College. *Revista de Artilharia*, April and May, '16. 10,000 words. To be continued.]

(This paper was prepared as a part of the final examination of the author for his degree at the University of Lisbon, in the year 1914-1915, and is an historical description of the Portuguese Military College from its foundation.)

**STANLEY, D. S.**

[Personal Memoirs of D. S. Stanley. Commencing in Jan, '16, number. *The Military Historian and Economist*.]

(A document of historical interest, based on contemporary diaries and other data. Not originally written for publication. Descriptive of the author's career at West Point, and including the Civil War. Following installments to appear in successive issues of *The Military Historian and Economist*.—Ed.)

**STEEL**

*See also*

CARTRIDGE CASES—USE OF STEEL FOR

**STRATEGY**

[War Game—XII. Strategical Plan of a Campaign and Its Tactical Details. By Lieut. Guido von Horvath. *Scientific American*, June 3, '16. 3600 words. Map and diagram.]

War plans can only provide for the initial moves in war—for the mobilization of the forces and matériel, and for speedy transportation to points of strategic importance. Hereafter the course of events will be governed by tactical decisions, which are the uncertain factor in warfare. Plans will be offensive and decide when and where to strike, or defensive and decide how much to yield. Military administration is illustrated by a diagram. (The remainder of the article consists of final answers on the preceding problem, a landing operation. This article is the last of the series.—Ed.)

[Cannæ. *Krigsvet.-Akad. Tidskrift* (Sweden), Jan, '16. 6500 words.]

(An article dealing with the teachings of

<sup>\*</sup>*Applicati* are officers who have successfully passed the War College, but who afterward in service have shown inaptitude for the General Staff. They remain with their troop units, and are called to the General Staff only in case of necessity.

the German General Staff and their success in the present war.—Ed.)

On Feb 7, 1897, an important change took place in the Prussian General Staff. Moltke's first successor, the cavalry general, Count Waldersee—later made First General and General Field-Marshal—had, as is generally understood by reason of politics, left this office of great importance and been transferred to Altona as the Commanding General of the Ninth Army Corps (Schleswig-Holstein). For the office vacated, i. e., Chief of Army's General Staff, Count Alfred von Schlieffen was selected, which office he held until the close of 1905.

The second successor of Moltke was an untiring worker, a sharp thinker and a well-chosen leader and instructor of the general staff personnel. He prepared them for the great war, involving millions of troops. The leading principle in his teachings was winning a war not by partial advances, but by large annihilating battles. To the enemy's utter destruction, all forces must be directed and the will that was to lead them was the will of complete victory. "Die Vernichtungsschlacht," the highest goal that an army leader could hold out to his men, would be brought about by attack from two or three sides.

The idea of such attacks, Schlieffen has worked out in a series of articles called "Cannæ," published in "Vierteljahrhefte für Truppenführung und Heereskunde" (banden VI-X), published during the years 1909-1913.

The nucleus for these tactics is drawn from the battle of Cannæ, and in his studies he maintains that such a battle can be fought in modern times. The enemy's front must not be the goal for the strongest attacks; the essential is to press back his flanks. These, however, must not be sought at the ends in front, but he must be met throughout his whole front and depth. The annihilation would be completed by attacking him in rear.

Subservient to such strategy and battle tactics, Schlieffen applies his Cannæ investigations to Frederick the Great's and Napoleon's battles and the wars of 1866 and 1870-71, calling attention to battles that nearly fulfilled the Cannæ requirements, such as Waterloo, Langensalza, Königgratz, Gravelotte, St. Privat, pointing out in the last where Moltke's plans miscarried because his army corps leaders did not completely grasp his simple but comprehensive schemes to bring about a "Vernichtungsschlacht."

One is sharply reminded of these teachings by the movement of the German right flank under von Kluck as it drew near Paris, turning off not towards Paris, but to the south and southeast.

Schlieffen closes his series with careful consideration of the operations which led to the battles of Beaumont and Sedan, calling the latter a typical Cannæ.

A summary is given in the last article of the leading characteristics of Frederick's the Great and of Napoleon's field strategy and battle tactics, and is as follows: The foundation for

a Cannæ is a longer battle line against a shorter; in several cases also deeper. The overrunning wings swing in against the flanks, the cavalry, already ahead, against the rear. Should the flanks for some reason have separated from the center, they must close in, so that the line can continue forward united to a surrounding attack, and can immediately be sent against the flanks and rear. It is just this that Moltke calls "uniting of the separate parts on the battlefield," and explains that it is the very best a commander can do. Most commanders shun the danger of having the parts defeated before uniting, and therefore go to a great deal of work and trouble to bring about a union, not on the battlefield, but before reaching it. But by so doing the decisive advantage has escaped and the result is little or perhaps no advance at all.

From this example, Schlieffen continues his final considerations of the war between France and Germany in 1870. Even then a formidable coalition threatened Germany, but Moltke still held that where there was no enemy there should be no observation corps, no army corps, and hence he directed sixteen army corps against France.

There can be no doubt that the movements of the German armies in Aug, 1914, show a great many traits of Schlieffen's corps and troop maneuver principles: the use of the strongest possible forces on one front; chiefs of the corps fully empowered, advancing with each corps on separate roads; advancing echelons on that flank which is to bring about the turning movement; also just as nearly as possible no strategical reserves (corps reserves, army reserves, etc.).

This plan indicates a quick and decisive offensive in France, a plan directly opposed to what Count von Caprivi advocated in the Reichstag in 1893, that in case Germany should have war on two frontiers the offensive should be on the east and the defensive on the Rhine line. Events have not as yet shown this to be wrong.

More success has been had on the eastern front. Around Hindenburg were younger men who were a guarantee that Moltke-Schlieffen-Hindenburg traditions should live. The battles of Tannenberg, Angerberg, and, finally, the winter battle by the Masurian Lakes, were complete "Vernichtungsschlachten," as taught by Schlieffen.

On the western front, the tactics of breaking through have taken the place of flanking movements. Even these tactics have been fully successful as carried out by Mackensen in the east on the Gorlice-Tarnow line. This movement also consisted of flanking the wing that had been forced back, and is the greatest example in history of breaking through a defensive line.

As remarked by Schlieffen, a typical Cannæ requires not only a Hannibal, but also a Terentius Varro; a Sedan not only a Moltke, but also a French government's order for the disastrous march to the relief of Metz; likewise, Tannenberg and the Masurian Lakes battles required not only a Hindenburg, but also such

**STRATEGY—Continued**

field-m Marshals as the chiefs of the Narew Army and of the Tenth Russian Army, who either did not understand the threatened danger, or were unable to withdraw in time. Angerberg did not become a complete Cannae because *Rennenkampf* abandoned the left flank of the Niemen Army and withdrew the remainder of his troops to the rear in an easterly direction.

[Napoleon, Moltke, and Manchuria. By 2d Lieut. E. W. Sheppard, Royal West Kent Rgt. *United Service Magazine*, July, '16. 3600 words.]

(Continued article; comparisons of Napoleon's, Moltke's, etc., strategy.)

[Conduct of Operations. By V. Estmestev. *Voenny Sbornik*, June, 1916. 4200 words, with biography.]

As von Moltke says, the further military operations advance, the more difficult is it to come to a correct conclusion as to the proper course to take. It is necessary to take as clear a view as possible of all circumstances affecting the situation, or in other words to make a correct estimate of the situation. But it is practically always necessary, in order to carry out a definite purpose, to have but one line of operations.

March maneuvers, or the science of calculating the marching capacities of troops, especially when operating outside of the immediate vicinity of the enemy, are of the greatest importance in securing final success. The campaigns of Napoleon are full of examples of the use of the marching capacities of troops in obtaining final victory. But of course when proceeding to the strategic offensive it is necessary to keep clearly in mind not only the marching abilities of our own troops, but also the number and marching abilities of the enemy's forces, and to secure a superiority of strength at the decisive point. And the supply of large forces is a problem of much intricacy, and needing much study for its proper solution.

Bernhardi has pointed out the necessity of proportioning the front of armies to their size, in order that their base may be suited to their need of supplies, and this question must always be very carefully considered. But that does not relieve a commander from complying with the recommendation of Napoleon constantly to interrogate himself as to what action he should take if the enemy should unexpectedly appear on his right, on his left or in his rear.

Is it necessary to point out the errors made in the battle of Sandepu? Here by failing to calculate the time required for maneuvers, we took four days to deliver an attack on the enemy's left wing, giving him an opportunity to concentrate reinforcements, of which he took full advantage, resulting in our failure to accomplish our mission. And each corps of the II army made the same error.

The essential thing in all operations is that they shall be calculated with the utmost care;

especially is this required with the immense forces employed in modern wars. Every possible event must be considered and provided for as far as means at hand permit. The strength, position and movements of the enemy must be determined; and this done the next important consideration is the enemy's morale. All great generals have followed this line of reasoning with success, and have always provided for every possible contingency. Finally, as Napoleon says, battle should not be hazarded except when the chances are at least 70 out of 100 in our favor, as a battle has from its nature always a doubtful outcome, but once engaged in the fighting should be continued with a fixed determination to either win or perish.

[Napoleon, Moltke, and Manchuria. By 2d Lieut. E. W. Sheppard, Royal West Kent Rgt. *United Service Magazine*, Aug, '16. 4000 words.]

(Historical comparisons of strategy.)

[Napoleon, Moltke, and Manchuria. By 2d Lieut. E. W. Sheppard, Royal West Kent Rgt. *United Service Magazine*, Sep, '16. 3600 words.]

(Serial of historical comparisons.)

See also

RAILROADS—STRATEGIC

SERBIA—HISTORY

(Article: "The Strategic Significance of Serbia")

TACTICS

**STREAM CROSSING**

See

RIVER CROSSINGS

**SUBMARINES**

[Submarine Types. By Rear-Admiral Degouy, French Navy. *Revue des Deux Mondes*, Nov 15, '15. 8000 words.]

[The author of this paper, after touching upon the technical evolution of the submarine, takes up the question of type in relation to the present war. The abstract follows from this point.—Ed.]

The first case that presents itself is the defense of an important port, whether commercial or military. Here evidently neither great power nor "endurance" is called for. Submerged action will be confined usually to trips of from 30 to 40 miles, out and back, passing, if necessary, under the advanced hostile line of light vessels. Storage batteries in this case may not prove unacceptable; electric motors will answer. The only weapon needed is the automobile torpedo. An extension of this case calls for defensive submarines giving general protection to the coast, or to essential strategical areas not in the immediate neighborhood of a naval base of operations. Hence the need of increasing the radius of action, and, therefore, the displacement. Storage batteries, if used, must be recharged on board, whence a fresh increase of displacement, and one faces at once a complication of motors. The double apparatus, the submerging and the navigating, imposes itself. In respect of arma-



ment, the automobile torpedo is still all-sufficient.

The defense of harbors and of territorial waters once assured, it is natural to contemplate carrying submarine warfare into enemy waters, or into theaters of operations more or less distant. In other words, the offensive becomes the purpose. Here we must distinguish: 1st, attacks upon enemy coasts; 2d, war upon the high seas (such as operations directed against commercial routes, channels of communications, and of supply); 3d, fleet warfare (operations between battleship fleets).

The effect sought in attacking enemy coasts is that of surprise, by penetrating submerged and unseen into the roads or other areas, in which enemy units are refitting or equipping. And here it is astonishing to note that no one, not even in far-sighted Germany, seems to have thought it necessary to provide the means necessary to secure this surprise effect. For, obviously, nets, whether rope or wire, would be stretched across the menaced points, in anticipation of submarine attacks. Given the actual submarine, it is evidently most difficult, if not impossible, so to transform it as to receive no damage from these nets. Hence means should have been provided in advance to dispose of these nets, and to cut the cables, frequently reinforced, of the mines that might be encountered. The automatic mine is indicated, therefore, as the weapon that should be furnished; if the submarine or the submersible recognizes the impossibility of forcing an important pass, this mine could be used in closing the pass to its owners. Furthermore, it could be planted in positions completely out of the reach of the standard mine planter. But this is not all: we have to consider, in addition, the question of radius of action and of general endurance when submerged.

If it be sought to give a *submersible* a high speed and great radius of surface action, then its value submerged diminishes. The vessel becomes too much a torpedoboat at the expense of its submarine possibilities. A clear distinction must be drawn between the type of under-water boat for coast attack and the type needed for service on the high seas and in fleet operations proper. In these two cases, speed and radius of action evidently are of great importance. But here again we must differentiate. Speed is the dominant quality of the submarine accompanying a battle fleet, and radius of action that of the cruising submarine. A speed of 16 knots will answer for this latter type; commercial vessels steaming faster than this are fewer than people think. On the other hand, this speed would be wholly insufficient for the work of the battle-fleet submarine; it must have at least 20 knots. Speed, submerged, so far, even in the best examples of this type, does not exceed 12 knots; even if pushed up to 15, it is doubtful if this would be fast enough for the tasks of battle.

To secure the speeds of which we are speaking, there can be no doubt that a great increase of displacement is necessary. On the surface, 1000-1200 tons are already admitted.

This will impose the condition of surface navigation inshore, in estuaries, and in narrow and shallow channels. But even then the battle submarine, protected as it will be by the fleet, will have practically nothing to fear from enemy dirigibles and aeroplanes.

In respect of the radius of action to be considered for each of the types in question, there is no risk in saying that the cruiser should have twice that of the other. The battle submarine, in contact with the fleet, can draw upon all the resources of the latter. The cruiser would normally have a surface radius of 2000 miles, 4000 if petrol be substituted, at the start, for water ballast. German submarines are, upon good authority, said to have made the journey from Heligoland to the Dardanelles supplied for 3000 miles, a considerable result for vessels displacing only 675 or 700 tons on the surface, and about 850 submerged. The radius of action of the submarine submerged must also be liberally computed; for operating in a necessarily limited zone, as it must, it will be most exhaustively searched for by speedy enemy ships, and the more frequently it has to come to the surface the greater the chances that the search will be successful. This coming to the surface is the critical phase in the existence of a submarine. A very great improvement will have been made when only one motor is carried for both surface and submerged positions; but it must not be forgotten that methods of looking for and detecting a submarine will also improve with time and experience.

What should be the armament of these two types? Strictly speaking, the battleship submersible needs nothing but the automobile torpedo, provided it be as powerful, swift, and accurate as science can make it. Guns would be of no use, and the automatic mine will be provided by the mine planters. The armament of the cruising submarine, on the other hand, must be absolutely complete, as occasion will offer for the use of all of its elements. The automobile torpedo will be reserved, of course, for war vessels or for great commercial vessels furnished with watertight compartments. Guns will be used against commercial vessels of ordinary type, and as these may be sunk by a high-explosive cartridge suitably placed on board, so will it be advisable to carry a supply of demolition explosives. Automatic mines will be provided. Of guns, there will be two, and perhaps more; one of these must be so designed as to be available against aircraft. It follows that this type of submarine will be of considerable tonnage; a surface displacement of 2000 tons would appear to be an ideal easy to realize.

A failure on our [French] part to appreciate the necessity of different types of submarine has already caused us difficulties in the present war. The remedy consists in setting about the construction of the representatives that we need. But let us bear clearly in mind that our objective should be the military submarine, and not the exponent of mere mechanical engineering ingenuity.

## SUBMARINES—Continued

[Discussion Regarding Submarines. *Army and Navy Register*, Dec 4, '15. 450 words.]

In the discussion among naval authorities of the problem of the size of submarines, the 800-ton boat has been recommended for the submarine flotilla. It is pointed out that the 72 boats now built, building, or authorized, cannot be considered seagoing submarines, but are sufficient in number for harbor and coast defense, and that the fleet submarine authorized should be the large 800-ton boats of greater cruising radius. Attention is called to the fact that K, L and O boats can keep at sea not longer than ten days or two weeks, while the 800-ton boats remain out for 21 days. This means that, operating 1200 miles from the coast, the 800-ton boat could remain 10 days on the operating ground, while the K-boat could remain only one day, both boats cruising at 10 knots.

Further advantages of the larger boat pointed out are an increased number of torpedoes and larger ammunition stowage, greater seaworthiness, greater radius submerged and habitability.

[The Development of the Submarine. *The Army and Navy Gazette*, Dec 4, '15. 1000 words.]

The announcement from Copenhagen that a newly-built German submarine cruiser, the "H 5" has passed the Sound, directs attention to the immense development in such craft.

The new boat is said to be of the size of a small British cruiser, and heavily armed. In the 1914 *Naval Annual*, Mr. Alexander Richardson spoke of one of the German submarines, then nearing completion, as having a submerged displacement of 900 metric tons, with 750 tons on the surface, the speeds above and below water being twenty and ten knots respectively. Russia was building vessels of considerably over 1000 tons, and the French had boats of 900 and 950 tons in hand at Rochefort and Cherbourg. The tendency for still larger boats is most marked in the United States. In her program for this year are included, in addition to 25 coast submarines, five fleet or seagoing submarines. The existing types of submarines, of which the United States navy has about forty [sic] have a surface speed of from twelve to fourteen knots, and a radius of action at nine or ten knots of from 1500 to 4500 miles. The displacements of the boats range from 250 to 550 tons when submerged. The largest yet launched for the American fleet is the "M 1" which was put afloat at Quincy, Mass., on Sept 14 last. She is of 750 tons displacement, 185 ft. long, has a surface speed of sixteen knots and a cruising radius above water of 5000 miles. She is fitted with four torpedo tubes, and has a disappearing R. F. gun on deck. The new fleet submarines will have 1200 tons displacement, maximum speed of twenty-two knots.

There are already in the water submarines of 18 to 20 knots surface speed, 13 to 14 knots submerged.

The functions of a submarine are two-fold: first, defence of harbors and coasts, the prevention of landing operations, and the protection of fleets, etc., as well as scouting; and second, offense, the destruction of the enemy's vessels, both war and commercial, at sea or in his ports, or, in combination with fleets or flotillas on the high seas, and long distance raids. For the first purpose high speed and large radius of action are not necessary.

The fleet submarine should be given a gun armament as supplementary to the torpedo. It has been shown by recent practice that the destruction of merchantmen raises the question of storage accommodation for bombs. Many more can be carried in a given space than of the more explosive gun projectiles [sic].

At present all the work of the submarine is of the nature of raiding, whereas if it is to take part in fleet actions, much more is to be demanded of it.

The submarine attacks in the Heligoland Bight, the action off the Dogger Bank, and the raid off Cuxhaven, were all frustrated by rapid maneuvering. If it be true that the Germans have evolved a submarine cruiser, it will be highly interesting and instructive to discover what such a craft can do.

[The Submarine in War. By R. W. Neeser. *Scribner's Magazine*, Jan, '16. 9000 words. Illustrations.]

(On the technical side, this article considers matters already reviewed in the *Digest*. It gives examples of the performance of the submarine in the war, and discusses its influence on operations.)

[Submarine Warfare. *Scientific American*, Feb 5, '16. 2700 words. Illustrated.]

The submarine has not accomplished as much as was expected against naval vessels, and has shown a surprising versatility. Germany was one of the last nations to take up the submarine development, but has shown herself a master in this class of weapon. The only achievements comparing with the German submarine work are the British submarine operations in the Baltic Sea and in the Sea of Marmora. Submarines are of early origin. Bushnell constructed a crude submarine during the Revolution and made in it an unsuccessful attack against a British warship. In 1883, Nordenfelt built a submarine at Stockholm, 64 feet long and displacing 60 tons. It was propelled by steam and may be regarded as the forerunner of the present day submarine. The latter has a submerged speed of 10 to 11 knots and a surface speed of 18 to 20 knots, with a cruising radius of 5000 to 7000 miles. It carries 10 or 12 torpedoes.

A graphic account is given by Lieut. Weninger, commander of the German submarine U-17, of his experience in being entangled in a net and attacked by British destroyers. The net was broken by deep submergence,

but both the rudder and the manometer were disabled. By skilful work, Lieut. Wenninger was finally after several hours able to get away under cover of darkness.

See also

UNITED STATES—COAST DEFENSE—AGAINST SUBMARINES

—Defense Against

See also

EUROPEAN WAR—MILITARY LESSONS OF THE (Article: "Military and Naval Notes Abroad")

—Motor Boat Submarine Destroyers

[Armored Motor Boat for the Navy. *Army and Navy Register*, Dec 11, '15. 250 words.]

In line with the acquisition by the British navy of small boats for use against submarines, our navy has adopted an experimental type of high-speed motor boat. It is to have a speed of 41 miles an hour in smooth water, and the requisite seaworthiness and strength of hull for torpedo attack in open ocean in heavy weather. It will carry one 18-inch torpedo tube and a one-pounder rapid-fire gun. The length will be not less than 40 feet, and the propulsion will be by gasoline motors fitted with electric self-starters.

[Note. *Army and Navy Jour.*, Jan 29, '16. 200 words.]

A new type of high speed motor boat has been developed and submitted to the Navy Department. The type is 50 feet long, with 1200 h.p. engines capable of developing a speed of 41 miles per hour. These boats will have a crew of three or four men, and carry a 1-pounder and a torpedo tube. They can be hoisted aboard the larger war vessels.

[Submarine Destroyers. *Popular Science Monthly*, Aug, '16. 1500 words. Illustrated.]

Fast motorboats are used to hunt down submarines. A trial order for this type of boat was placed in the United States, and a second order proved that the boats were successful. Each boat has three 175 h. p. engines, with designed speed of 26, and an actual speed of 30 m. p. h. The boats are 60 feet long, 10 feet beam and 2 ft. 10 in. draft, with accommodations for a crew of 8. The pilot house is armored, and there is room for a quick-firer. The boats are of V-type, with sharp bow. A few feet back is a shoulder on each side which serves to lift the hull partly out of the water when running. The light draft makes them practically immune from danger from mines or torpedoes. Two rudders enable them to turn around in a little more than their own length, or to steer a violent zig-zag course.

—Photography

See

PHOTOGRAPHY—SUBMARINE

—Use of in Laying Mines

See

MINES—LAYING—BY SUBMARINES

—Use of in European War

[Operations of U-Boats in the Mediterranean. Editorial. *Artill. Monatshefte*, Jan, '16. 200 words.]

## LOSSES

Auxiliary cruisers and troop transports:

6 English ..... 37,612 tons  
2 French ..... 6,051 "

Transports with war material

19 English ..... 71,564 tons  
6 French ..... 22,135 "  
1 Japanese ..... 5,118 "  
Hostile and neutral ships with contraband  
14 English ..... 49,839 tons  
5 French ..... 9,384 "  
2 Russian ..... 1,500 "  
2 Greek ..... 5,412 "  
1 Norwegian ..... 3,512 "

Total, 58 ships with a tonnage of 220,000, of which 39 English with a tonnage of 159,000.

[Operations of German Submarine Boats. By Lieut. Col. Von Wochinger. *Jahrbücher, deutsche A. u. M.*, Apr, '15. 800 words.]

(A discussion of the considerations that led to the German submarine operations against British transports and British merchant vessels, with a brief summary of the earlier results of those operations.)

[War by Submarines. By Arthur Pollen. *Land and Water*, Apr 20, '16. 2300 words.]

The losses of vessels by submarines and mines in the 29 days between Mar 20 and Apr 17 totaled 72, of which 42 were British, 27 neutral and 3 allied.

It is conceivable that Germany might organize the submarine work so successfully as to make it impossible for British trading ships to continue at sea. This might occur if the accomplishments of the last month could be multiplied by three or four, and kept up for weeks and months.

The daily average of vessels lost since the new submarine campaign started is nearly 2½ per day. If this rate could be kept up, about 900 steamers a year would be destroyed.

A reduction in imports of about one-fifth would be necessary in the first year were British vessels alone depended upon and no losses replaced. In the second year, a reduction of one-quarter would be necessary, and so on. In two years the situation would become critical. Neutral vessels are available, however, and the present rate of destruction cannot be kept up. The curve of destruction will tend to return to the normal for reasons inherent in this class of war.

Until a submarine is produced that can attack and destroy its pursuers, or is impenetrable to the weapons its pursuers can bring against it, the ultimate defeat of the submarine is certain. Pursuers can combine against submarines, but submarines cannot combine against pursuers.

[Enemy Activities at Sea. By Arthur Pollen. *Land and Water*, 28 Sept, '16. 3400 words.]

Although the detailed information of the German submarine attacks on Allied and neutral trading ships is no longer made public, it is clear that the underwater campaign is

**SUBMARINES—Continued**

as lively and as menacing as ever it was. It is also clear that it fails to come up to the expectations of the German jingoes. Germany is at last alive to the truth that if England is to be beaten—as of course she must be; unless she is, the others never can be beaten—then the trick must be done at sea. For certain reasons it has become the Allied policy to maintain silence about submarine successes, the greater part of which must be well known to the Germans. The disadvantages of this policy are obvious; for since May, when the rule of silence began, a great many ships have been attacked and sunk in absolute defiance of the German undertaking to America of May 4th. The people of America are about to elect a new President. The two candidates, and the parties that support them, are of one mind in thinking it America's chief business to be neutral, and the undertaking of May 4th is quoted to show that neutrality is compatible with a firm assertion of national rights and dignity. It could do the German cause no good and the Allied cause might be benefited if the utmost publicity were given to every case in which a ship was attacked and the lives of passengers and crew jeopardized by submarines torpedoing without warning. Of late, the German had added to his underwater activities three or four successful efforts with surface craft. Certain British and neutral steamers have been captured by forces sent out from Zeebrugge. Amongst the prisoners taken from the Dutch mail steamer are some naval ratings from the interned in Holland who were on their way to England on leave. To have taken them at all was a gross slight on Dutch sovereignty. It will be interesting to see if the Dutch succeed in obtaining the surrender of these prisoners.

See also

EUROPEAN WAR—SUBMARINES IN

**SUBSISTENCE**

See also

RATIONS

REFRIGERATION

**SUEZ CANAL**

[The Maritime Canal of Suez. *Revue Mil. Suisse*, Jan, '16. 2500 words. Maps.]  
(An historical and statistical article.)

**SUMMER INSTRUCTION CAMPS**

See

UNITED STATES—MILITARY POLICY OF—  
BUSINESS MEN'S CAMPS

UNITED STATES—MILITARY POLICY OF—  
STUDENTS' SUMMER INSTRUCTION CAMPS

**SUPPLY AND TRANSPORT**

[The Transport Officer. By a Captain at the Front. *The Canadian Military Gazette*, June 27, '16. 1300 words.]

The Transport Officer is the link between civilization and the barren waste in which his battalion is operating, and his work must never cease. His chief duty is the transportation of supplies, by means of horse-drawn vehicles, from Q. M. base to battalion headquarters. When his troops are in the trenches he re-

mains behind at the point where his wagon and animals are billeted. His troubles with poor roads, unmanageable mules, etc., are greatly increased by the fact that nearly all movement of supplies to the trenches must take place after dark. These supplies include food, coal, wood, mail, ammunition, clothing, all kinds of engineering equipment and, in some cases, water. The last-named article is carried in the regular water-carts, each battalion being equipped with two.

On a quiet night the noise made by the transport column is audible for miles, and the enemy knows from his maps and aeroplanes which roads are most likely to be used by the transport. This makes it easy for him to drop shells on the convoy lines.

In addition to being a hard worker, the Transport Officer must be an efficient organizer and creator. He must first select likely men as his drivers and then train them in their arduous duties. His animals must be kept in perfect condition, and this is one of his hardest duties. In the billeting areas sufficient standing places must be erected for all the animals. In every village through which the transport will pass regularly, watering troughs and forges for shoeing must be placed and kept in a serviceable condition.

*Colombia (U. S. of)*

[Notes on the Service Supply and Transportation of an Army in the Field. By Lieut. J. Zornosa A., Infantry. *Mem. Estado Mayor* (Colombia), Apr, '16. 700 words.]

Due to the mountainous character of Colombia and to well-known economic reasons, it has been impossible to build a system of railways connecting the center of the country with the coast and with the frontiers. The supply and transportation problem must be solved by utilizing pack trains; and our regulations on the subject must be based on such system.

The Colombian muleteer has the advantage of experience in the handling of pack transportation. It would only be necessary to give him a simple military instruction, so that his services may be utilized in the case of a big war. These men, by nature, observe some sort of discipline. There is hardly ever a report of any damage to the cargo or of the loss of an animal.

The subject of pack transportation involves a good many calculations and the drawing up of regulations, which should be prepared by professionals. In covering every detail, advantage should be taken of the resources of the country and of aptitudes of the inhabitants. We should not forget the fact that the liberating army transported from Boyacá the cartridges used at Ayacucho.

*United States*

[Note. *Army & Navy Jour.*, July 1, '16. 200 words.]

Bids were opened June 26 for over 42,000 horses, for 16,000 draft mules, and 4,000 pack mules, all for the use of the National Guard. The cost will be over \$9,000,000. The horses will unquestionably be needed, but possibly some of the money expended for mules ought

to have been expended in the purchase of motor trucks. The latter have shown their value in the border work.

[\$10,000,000 for Army Horses. *Army & Navy Jour.*, July 1, '16. 300 words.]

The Secretary of War has authorized the purchase of nearly \$10,000,000 worth of horses and mules, including 19,000 small cavalry horses, 20,000 artillery horses, 3000 pack mules, 5700 wheel mules, and 8800 lead mules. The orders were distributed between Front Royal, Seattle, Fort Reno, Fort Sam Houston, Kansas City, and Fort Mason, Cal.

See also

AERONAUTICS — TRANSPORTATION OF SUPPLIES

AUTOMOBILES

DOGS

MOBILIZATION

MOTOR TRANSPORT

RAILROADS

RAMPS, LOADING

ROADS, MILITARY

SANITARY SERVICE—TRANSPORTATION OF SICK AND WOUNDED

SHIPPING TRANSPORT

SHIPS AND SHIPPING TRANSPORT

#### —In European War

[Australians in France: With the Supply Column. By H. S. Gullett, official Australian correspondent at British H. Q. in France. *Australian Mil. Jour.*, Jan, '16. 2200 words.]

(Half the article describes an evening entertainment. The remainder gives a popular description of the motor transport service. The service has its attractions, one of which is a good place for the driver to sleep, but the hours are long and the labor hard.)

#### —Interruption of by Artillery Fire

[Use of Heavy Artillery to Destroy Communications to the Rear. Editorial. *Artill. Monatshefte*, Sept-Oct, '15. 400 words.]

The Germans are now using their heavy artillery to destroy the enemy's lines of communication. At Dammerkirch, the viaduct was thus destroyed by long range firing with heavy artillery. When this was then replaced by the new French Mansbacher viaduct, the latter was also destroyed by long range fire. The Germans have now resorted to the use of the 42 cm. howitzers to destroy the road at the point where it is cut into the mountains in crossing the pass. The road over the pass has thus been completely blocked, preventing all traffic and compelling the French to go by a round-about way. The firing was probably at a range of 9 km.

#### —Use of in U. S.-Mexican Expedition, 1916

[Army Transportation in Mexico. *Army & Navy Register*, June 3, '16. 300 words.]

About 7200 cavalry and artillery horses have been purchased for use in Mexico at a total cost of \$1,369,000. About 2000 draft and pack mules have also been purchased at a total cost of \$365,000. Cavalry horses cost \$135 to \$165, artillery horses \$135 to \$175, draft mules \$180 to \$200, and pack mules \$135 to \$150. These prices are regarded as reason-

able, in view of the presumed scarcity of animals due to shipments to Europe.

Ten White and ten Peerless tank trucks have been purchased at a total cost of \$76,500. The search for a substitute for gasoline has not revealed anything suitable.

#### SURGERY, Military

See also

DENTISTRY

#### SURRA

[Should Officers Be Allowed to Bring Back Mounts from the Philippine Islands? By 2d Lieut. S. M. Walmsley, 7th Cavy. *Jour U. S. Cavalry Assn.*, Jan, '16. 2400 words.]

The question is: Is the loss of horses to the individual officers, and to the service at large, outweighed by the danger of introducing surra into the United States? The ruling preventing the shipment of horses from the Philippines to the United States was proper when made, but appears to be no longer necessary. Surra was then very prevalent in the islands, and little was known of the disease, its transmission or suppression. In recent years, cases of the disease among army animals have been comparatively rare. The records of the 7th and 8th Cavalry regiments, covering periods of three and two years, respectively, show no case at all. The cases that have occurred in recent years among animals of the Q. M. Corps resulted in no heavy loss of animals or spread of the disease, although local conditions at times favored the latter. The study made of the disease indicates that its incubation period is short, ordinarily less than two weeks. Chronic surra carriers can be detected by microscopical examination of the blood. It is very improbable that, even if an infected animal were shipped, it could reach the United States undetected. In a known case where the disease was introduced at New York, in a shipment of cattle from India, it did not spread, the infected animals having been killed and the others quarantined. Under present conditions the danger appears too remote to justify the heavy loss that army officers annually incur, incident to the enforced sale of their mounts on leaving the Philippines. The mounts thus sold are ordinarily separated from the service; and the knowledge that good animals will have to be sacrificed tends to discourage officers on duty in the Philippines from taking over, or purchasing, any but inferior animals for use while in the islands.

#### SURVEYING

See also

MAPS AND MAPPING

SKETCHING

#### SUSPENSION BRIDGES

See

BRIDGES, MILITARY—SUSPENSION

#### SWEDEN.

—Army—Artillery

See also

FIELD ARTILLERY—SWEDEN

—Coast Defense

See also

COAST DEFENSE—SWEDEN

## SWITZERLAND

### —Army

[The Swiss Mountaineer-Soldier. By Thomas D. Donovan. *The National Guard Magazine*, Jan, '16. Illustrations. 2000 words.]

In Switzerland, despite the fact that a well trained army of 400,000 men can be raised at a moment's notice, and despite the large size of its army as compared to its population, there exists no spirit of militarism; but rather the opposite is true. The officers are promoted only for efficiency and in private life they may occupy more humble positions than their men.

Since the outbreak of the present war there has always existed a great temptation for one of the great armies to outflank its opponent by cutting across a corner of Switzerland. This fact early necessitated the mobilization of the Swiss troops, and since the beginning of the war they have been fitting themselves for what *might* come.

The mountaineer soldiers compose only a small part of the army but they are believed to be the best troops of their kind in the world. These troops, both officers and men, have always lived in the mountainous regions. Therefore they are particularly fitted to undergo the hardships which fall to their lot. Two years ago 600 men in a blinding snow storm and with only a compass to guide them marched down the Aletsch Glacier, 16 miles, in twelve hours. The march was made in snow-shoes, with full marching order, rifle and alpenstock. About the same time, another body of these troops crossed a small glacier with pack horses.

It is natural that Switzerland should possess the finest military ski-runners in the world. Last winter a patrol of six of these runners carried out a traverse of several of the big peaks of the Bernese Oberland. In all of these operations the danger of avalanches is constant and great endurance, skill and presence of mind are required.

After long-continued experiments, the pace best suited to sustained marches in these mountainous regions has been found, and this is now regulated with great care, using the watch. Sometimes in ascending very steep slopes the pack mules are placed in front, thus taking advantage of their steady, unchanging gait to regulate that of the column.

### —Army

[The Swiss Army. By Captain Remy Faesch, Swiss Army. New York, Stechert, 1916. Price, 25 cents. 4000 words. Illustrated.]

(This is an instructive pamphlet intended to give our people some idea of the Swiss system. After a few remarks on Swiss history and the nature of the government, the author goes on with a description of the features of the system.)

The national budget for 1913 was \$20,000,000, of which \$9,000,000 was for the army. Every Swiss citizen, whether living abroad or not, must either do military service or pay a military tax. This tax amounts to: \$1.25 a year,

1.5 per cent. of one's own income, and 1.5 per thousand of parent's personal and real property, divided by the number of children. It must be paid until the men have reached the age of forty.

Every soldier of the Swiss Army can be forced to become an officer or a non-commissioned officer; to accept any command entrusted to him, and to perform the military service prescribed by law for the attainment of such command.

Every soldier is obliged to do target practice during the year when not called out for service.

Every soldier is obliged to keep at home in *perfect condition* his uniform, equipment and arms. During maneuvers, communities are required to shelter troops and horses. Owners of land are bound to hold their grounds at the disposal of the troops, when wanted for maneuvers. Damages are paid by the state. When mobilization is ordered, automobiles and gasoline must be turned over to the military authorities if wanted. Horses are requisitioned.

Military preparation begins before the boys have reached the age of 20 years. Compulsory gymnasium drill and physical training without arms in accordance with the army regulations are established in all the schools of Switzerland, which everybody has to attend from 7 to 15 years of age.

Hand in hand with this training in the schools goes the work in the Cadet Corps, which is compulsory in some of the Cantons, where marching, map reading and target shooting are taught.

Whereas an average from 4 to 8 hours a week is spent in gymnasium work in schools, the practice time for the Cadets amounts to about 100 to 200 hours during the summer.

After the boys have left school, voluntary work is begun in the Military Preparation Companies, established in almost every village and town, instruction being given by officers or non-commissioned officers, for boys between 15-20 years of age.

The first training—as will be shown later—which the young Swiss soldier gets, is very brief. If despite this fact the Swiss military authorities are able to make good soldiers out of the boys it must be borne in mind that this is due to the very carefully worked out system of physical development and military education for the Swiss boys between 7 and 20 years of age.

The physical and military preparation of the Swiss youth is an essential part of the Swiss military system.

On account of the short time available for service the military authorities make it a principle to use as much as possible the knowledge which the boys have acquired in civil life.

Sons of farmers, for instance, are enrolled in the Cavalry; mechanics, carpenters and men of similar profession become members of the Engineering Corps or the Artillery; students of technology become future offi-

cers in the former Corps and medical students in the Ambulance Corps.

When 20 years old, the young man receives his arms and equipment, *which he always keeps at home in good condition*, ready for instant mobilization.

He now enters a *Recruit School*, a training which varies from 60 to 90 days, according to the branch of service.

Hard work is done in these Recruit Schools; each day except Sunday, means 8-9 hours of drill and instruction.

After having accomplished their work in the Recruit School the boys are enlisted in the Regiments or Batteries of their home town or village and serve their country until their 48th year. If they become officers they serve until they are 52.

Swiss military forces are divided into 3 classes automatically passing from one class into the other according to age.

1. *The First Class (Auszug)* is made up of men who serve 2 weeks every year from their 20th to their 32d year.

These men form the "Elite." They are able to march carrying a heavy haversack (the Swiss haversack is the heaviest of all army haversacks; about 72 lbs.), and to climb hills without losing breath.

2. *The Second Class (Landwehr)* is made up of men from 33 to 40 years. They are called in for 2 weeks every 3d year.

They are less mobile than the men in the 1st Class but steadier, more mature and very keen in fulfilling their duties.

3. *The Third Class (Landsturm)* is made up of men of from 41 to 48 years. They are not called into service during ordinary times.

They are no longer able to run over the fields and march long distances in long columns, but they have lived with their rifles for twenty years, their eyes are still sharp and they know every footpath and every rock in the country. These *Landsturm Sections* protect the Swiss railroad stations, tunnels and bridges, the Alpine roads and great passes, baggage columns, electric central power stations and gun powder factories. They form the territorial army, whereas the first and second classes form the field army.

There is still another class, the *un-armed Landsturm*. This class comprises all those physically unfit as well as those volunteers who have not reached the necessary age or who are older than the law prescribes. According to their profession or abilities they have to help wherever they are needed (as bakers, butchers, typists in staff offices, in ammunition factories, etc.).

#### Officers and Non-Commissioned Officers.

**CORPORALS.** Men who excel in their military duties during their recruit school days are directed the following year to attend a school for non-commissioned officers. They are here put through a severe course of instruction of 30 days, calculated not only to teach, but to try out the metal of the man. After having successfully passed this test they become corporals. Every corporal is again obliged to go through a recruit school

immediately following these 30 days, where he is made chief of his squad.

He may become a Sergeant and later on a Sergeant Major after from 2-4 periods of maneuvers with his unit and after having received the training of one or two more recruit schools in the capacity of Sergeant or Sergeant Major.

**LIEUTENANTS.** Corporals are very closely watched; those who by their general education and character as well as by their military ability seem worthy to become officers, are sent to an *Aspirant School* of 80 days for infantry, 105 days for cavalry and artillery.

After successfully passing the requirements of the Aspirant School, the candidate is appointed a Lieutenant in the Swiss Army. While in this grade he is obliged the following year to attend a recruit school where he is responsible for his platoon.

A lieutenant has to serve at least 4 years before he is made a *First Lieutenant*.

**CAPTAINS.** First Lieutenants are promoted to the rank of Captain for merit only and not in consideration of their age. They must have served as First Lieutenants for 4 years and shown capacity in instructing recruits in another recruit school.

Officers of higher rank have to serve frequently and those who become officers of the *General Staff* in particular must always be ready to take part in maneuvers, in schools of the special arms or to work in the offices of the General Staff at Bern for several weeks.

There are only about 250 *professional officers* in the Swiss Army. They assist in the recruit schools as instructors and serve especially as professors in the so-called Central Schools for higher officers. Some of them command Brigades, Divisions or Army Corps.

**GENERALS.** Switzerland has no Generals in times of peace. As soon, however, as the Swiss Army mobilizes, the Federal Assembly designates a General from among the commanders of Divisions and Army Corps.

He disposes of all the military forces as well as of the economic and financial resources of the country. According to Swiss law, in times of war *one man* is honored and burdened with the entire responsibility.

No political influence whatsoever is possible in the Swiss Army either for becoming an officer or for arriving at a higher grade.

#### PAY

All members of the Swiss Army, officers and men are paid a salary while serving. The following are the rates of pay per day, food and board not being included in the rates for officers:

General	\$10.00	} plus 20c. for food
Commander of Division	6.00	
Commander of Brigade	5.00	
Major	2.40	
Captain	2.00	
Lieutenant	1.40	
Corporal	0.30	} in addition to quarters and meals
Private	0.16	

**SWITZERLAND—Continued**

Mounted officers receive in addition \$0.75 to \$1.25 a day, equivalent to the cost of hiring their mounts.

**HORSES**

In time of war the horses to be used by the Artillery and Train are requisitioned. In time of peace they are hired for the period of the maneuvers only.

As to *Cavalry horses*, the Swiss system is unique. The military authorities provide the necessary mounts for which the young cavalry recruit pays the Government. Every year, however one-tenth of this price is refunded so that after the expiration of 10 years the mount becomes the man's own property.

The result of this regulation is excellent. The men, after having completed their Recruit School training take their mounts home and use them for agricultural or other purposes all the year round. They treat and feed and stable their horses well and appear at the yearly period of two weeks' maneuvers with a mount in perfect condition.

The squadron commander exercises a certain control over the mounts during the year. Every horse is insured.

*Military Duties of the Swiss Citizen when not serving and during Winter Time*

Every man must fire about sixty shots a year and obtain a minimum score. If he misses the term he is called in for three days without pay.

*Non-commissioned officers* attend lectures and make excursions combined with target shooting at unknown distances.

*Officers* attend lectures. War games without troops, directed by an officer of the general staff, take place. The military authorities provide mounts for equitation exercises, and night patrols for lieutenants are arranged.

*The Swiss army is a national force.*

One member of the Swiss Federal Council is the Chief of the Swiss Military Department. He directs military matters, aided by the Chief of the General Staff, the Chiefs of Infantry, Artillery, Cavalry, Engineers and other high officers and functionaries.

The Cantons have to provide for the equipment (not the arms) of their contingents. The armories belonging to the Cantons are used for the storage of reserve material. Armories owned by the Confederation are generally used for the artillery and special arms.

The Cantons have the right to appoint the officers of their infantry units up to the grade of major after the Military Department or the respective commanders have given their consent, whereas in regard to cavalry, artillery and special arms, they have no power of control.

During strikes the Cantons have the right to mobilize the infantry units located in their district.

The "Military Director" (similar to the Adjutant General in the United States) is the member of the cantonal authorities who

carries out the orders received from the Military Department.

The cantonal authorities collect the military tax for account of the Confederation.

*Size of the Swiss Army*

In proportion to the size of her territory (about 16,000 square miles) and to the number of her inhabitants (about 4,860,000) Switzerland can actually put on foot the largest army in the world (about 500,000 men.)

This army can be mobilized in about twenty-four hours.

*General conscription in Switzerland is unanimously considered to be a blessing for the population.*

The effects of a few weeks of recruit school training are conspicuous, especially in the case of young men who but for the training would never escape from the narrowing influence of their limited environment. It is admitted, of course, that military service does to a certain extent interfere with business and the universities, and that certain trades and professions suffer financial loss during the period of military service. But these sacrifices are cheerfully made. Every Swiss is proud to serve and to wear his uniform.

*See also***ARMY—ORGANIZATION—SWISS SYSTEM****—Army—Cavalry***See***CAVALRY—SWITZERLAND****—Army—Organization**

[Switzerland's Citizen Army. *Army & Navy Jour.*, Feb 12, '16. 500 words.]

In an article prepared for the American Defense Society by the official Swiss bureau in the United States, it appears that military training begins in the schools at eight years. Every Swiss physically fit is liable for service, and the Swiss army is proportionately the largest in Europe, France being second and Germany and Sweden third. Other armies vary from one soldier to 110 inhabitants in Russia to one to 170 in Great Britain. The per capita cost of the Swiss army is \$2.25; German, \$2.10; France, \$3.35; British, \$4.00; and in the United States, \$1.00.

Swiss citizens who are unable to do their military duty pay a special military poll tax. This has been doubled on account of the war. There is, in addition, a property tax.

In 1910, 44,000,000 rounds of ammunition were fired at target practice in Switzerland, with its 3,800,000 population; Germany, with 67,000,000 population, fired 30,000,000 rounds; and France, with 40,000,000 population, 20,000,000 rounds. This explains why Switzerland has won the world's championship in shooting seventeen times out of eighteen. The Swiss team lost its only time in 1898.

Yearly inspections insure care of equipment. There are only a few men in the permanent establishment. Officers are paid only when on duty. Soldiers receive their expenses and sixteen cents a day. Recruits are paid ten cents a day.



—History

[The Return of a Contingent; Fribourg 1499. By George Nestler Tricoche. *Revue Mil. Suisse*, Jan, Feb, '16. 870 words.]

(An historical article, presented in the form of conversation, mostly concerning the arms of the time.)

See also

EUROPEAN WAR—RELATIONS WITH NEUTRALS—SWITZERLAND

—Military Policy of

[Preparedness in Switzerland. Editorial. *Revue Mil. Suisse*, Jan, '16. 1500 words.]

Our little country has been fortunate enough to end the year 1915 as it began it, in peace and relative well-being. We hope it will be the same for 1916, but we think it is well to examine what happened to some other nations that began it in apparent security.

The fate of Belgium and of Greece shows us how much the respect for the neutrality of a little people weighs when the vital interests of several great nations are at stake. That of Serbia shows how difficult it is for the weak to resist a skilfully prepared attack. Either one of the belligerent parties still has sufficient reserves to crush a small people before the other party could aid it effectively.

So it is no time for disarmament and by that, we mean moral relaxation rather more than we do a demobilization of our forces.

On account of having escaped from danger, many are beginning to disbelieve in it. Our civil authorities should react against this relaxation. The people should be made to understand that, as long as the present conflict lasts, the question of national defense is the important consideration. All should realize that it is not impossible for the war suddenly to cross into our territory.

The general staff of the army is entitled to be praised for having taken measures to maintain among our soldier-citizens that state of moral preparation which our civil authorities are inclined to neglect among our citizen-soldiers.

Last winter lectures were given to the troops by civilians. This winter the scheme is different, and the lectures are given by company, squadron and battery commanders or officers designated by them. To aid the lecturers, four pamphlets have already been issued on the choice of subjects and the manner of treating them. The lecture course, started as a means of combating ennui, has grown to be a means of national education.

The principal purpose of this winter's lectures will be the development of national sentiment. The lecturers will talk to the men of Switzerland, of its history, of its national beauties, of its political institutions. To maintain warlike virtues, there will be lectures on the present war. Stories of battles will be read to them, bringing out the acts of heroism that have been so numerous.

TACTICS

See

ATTACK

ENTRENCHMENTS—TACTICS

EUROPEAN WAR—MILITARY LESSONS OF THE

FIELD ARTILLERY—TACTICAL HANDLING OF  
FIELD ARTILLERY—TACTICS—CO-OPERATION  
WITH OTHER ARMS  
LANDING OPERATIONS  
MARCHES AND MARCHING  
MOBILIZATION  
RETREAT  
STRATEGY

—Artillery

See also

FIELD ARTILLERY—TACTICS  
TACTICS—COMBINED ARMS

—Cavalry

See

CAVALRY—TACTICS

—Combined—Army and Navy

See also

LANDING OPERATIONS

—Combined Arms

[The Modern Tactical Offensive. By Major T. E. Compton. *United Service Magazine*. Jan, '16. 2100 words. One sketch map.]

Although the offensive has the advantage of initiative and morale, it becomes very expensive in men and munitions when carried to extremes, as the Germans are inclined to do. The slow and tiresome defensive is sometimes the only reasonable policy to adopt. However, the rôle of the cautious offensive of the French army was inaugurated by a man who knows the art,—a distinguished engineer officer, General Joffre.

Although the strength of the defensive was increased by the introduction of smokeless powder, the small-bore rifle, the automatic machine gun, and more recently by barbed wire, the artillery has of late years adopted quick-firing guns which have overcome to a great extent this lead of the defensive. This is illustrated by the Russo-Japanese war in 1904, a lesson more appreciated in Germany than in the allied countries. The French fortified frontier towards the Rhine was probably the main cause of the development of heavy artillery in Germany, and the skill and secrecy in the manufacture of the 42 cm. (16½-inch) howitzer was admirable. "A single 42 cm. gun forms a battery with a strength of 200 men. It takes at least twenty-four hours to mount, after concrete foundations to a depth of twenty feet have been laid. Each gun consists of one hundred and seventy-two parts, weighing together about eighty-seven tons. Twelve railway wagons are required to move it. When it is fired, the men of the battery, besides wearing protection for mouth, eyes and ears, are ordered to lie flat on the ground. Its range is said to be accurate up to fifteen miles, and its effects at Liège were something quite new in warfare."

In Sept, 1915, the Allies were sufficiently strong in artillery and munitions to take the offensive, and in the battle of Champagne the preparations for attack illustrated the methods which must be followed in order to achieve success in the assault of an entrenched position. The result also proves that entrenchments are no longer proof against attack by good troops, and sooner or later the German

**TACTICS—Continued**

western line will be driven in on so broad a front and so deeply that the whole will have to be retired to a new strategic front. The September operations, though hardly on a scale to effect this, drove in the German line to a depth of one to two and a half miles on a front of fifteen, with a loss of twenty thousand prisoners and one hundred and twenty guns. The first of the methods adopted to ensure success was to so mystify the Germans that they massed large reinforcements in Alsace ready to meet the expected French attack, which was in reality being prepared in Champagne. The front chosen for the attack extended from Auberive to Ville-sur-Tourbe, about fifteen miles. The first German position, comprising three to five parallel lines of trenches separated by barbed wire entanglements, was organized in two zones of defence. Between the two zones were diagonal trenches, with the artillery positions in the rear. The artillery preparation consisted of (1) demolishing the barbed wire entanglements; (2) destroying the loopholes and knocking down the parapets; (3) burying the defenders in their improvised casements, and finally (4) to close and fill up the connecting trenches. The heavy artillery had the rôle of bombarding the enemy's headquarters, cantonments, railway stations, and of interrupting the supply of food and ammunition. The reports found on the bodies of German officers in addition to the success of the attack proved that the fire was effective.

The plan was to rush the trenches and surround the first position while the troops told off specially for the attack of the second position reformed in line against it, resulting in a varied rapidity of success in the different sections. The right wing at Auberive carried the German trenches at once, while the left was brought to a stop by machine gun fire. Sapping was resorted to in the Souain section in order to get on, but in the Perthes section the attack was entirely successful. Contrary to the rapid and brilliant success in the Beauséjour section, great resistance was encountered in the Mesnil section, and the German trenches on the slopes of a ravine could not be swept by the French artillery. All the trenches of the first and second zones and the batteries on the crest of Maisons de Champagne were carried almost in one run. The attack was supported by two squadrons of hussars, who dismounted when the infantry were momentarily checked, and attacked some small earthworks on foot. A renewed and combined attack of the infantry with the cavalry carried the earthworks. Where the attack was locally unsuccessful, it was due in almost every case to the barbed wire entanglements not having been sufficiently destroyed by the artillery. "Parallels of assault," that have been mentioned in reports, seem to be deep, narrow trenches sufficient only to hide troops, constructed in front of the main works for the purpose of attack. Steps are made in the parapet of these

trenches to allow the men a rapid egress in starting to the assault.

This example illustrates the lack of uniformity of progress along the front of attack after the taking of the first trenches. Some units were able to move forward rapidly, while others who came up against earthworks and screened machine-guns were delayed for hours, and in extreme cases even for days. An additional consideration is the fact that Champagne had been in the occupation of the enemy for a whole year and had been prepared for defense in a most thorough manner. However, in future wars it does not follow that all positions will have no flanks and will be prepared for defense several miles in depth.

**—Field Service—Attack**

See

ATTACK

INFANTRY—ATTACK

**—Infantry**

See also

TACTICS—COMBINED ARMS

**—Instruction and Training**

[Armory Instruction in Minor Tactics. By Capt. Herbert W. Congdon, N. G. N. Y. *Infantry Journal*, May, '16. 2000 words.]

The value of tactical walks for teaching principles of minor tactics is appreciated. But they are not always applicable to the winter instruction period of many city militia organizations. A substitute for the tactical walk has been used with good results in the armory in the evening.

The method is to make a lantern slide of a military or topographical map, and laying out a series of problems on this map, to make photographs of all points involved and important views from these points.

At first, map reading is taught by taking definite points on the map and showing them in landscape slides. After that, simple patrolling problems. The situation explained, the men are oriented; they are told: "You are here on the map, and looking to your left, you see this (landscape slide with the view). In front of you, you see this (another slide). At the edge of these woods (pointing), you see an enemy group of four mounted men emerging, etc. What are you going to do?"

**—Instruction and Training—Map Problems**

[Note. *Army and Navy Jour.*, Jan 15, '16. 150 words.]

The Book Department, Army Service Schools, Ft. Leavenworth, Kansas, has just published "Criticisms Upon Solutions of Map Problems," compiled by Capt. C. T. Boyd, 10th U. S. Cav. The book contains the criticisms of some eighteen different solutions of sixteen map problems of the 1911-12 series at the Army School of the Line. Reply of student and answering comment by instructor are included in some cases. The problems and approved solutions are given in full. The book is of great value to all officers who design to improve themselves by theoretical study of the problems of actual service. The Gettysburg maps are necessary to an understanding of the text.

—Instruction and Training—Map Problems—Advance

[War Game. III. The Advance to the Battle Field. By Lieut. Guido von Horvath. *Scientific American*, Apr 1, '16. 4000 words. Map and diagrams.]

(Explains the attack formations of infantry, cavalry, and artillery. The problem, involving a force of one regiment of infantry, one battery of field artillery, and a company of engineers, is that of moving forward with celerity and seizing the bridges across a river, the enemy having been reported in the vicinity.)

—Instruction and Training—Map Problems—Attack

[War Game IV. The Offensive Combat. By Lieut. Guido von Horvath. *Scientific American*, Apr 8, '16. 3000 words. Map. Sketch.]

(In this installment, the two forces have, under the given situations, come into contact. The advantages of the offensive are discussed. Under the given situation, one force elects to take up a defensive position, and the commander of the other decides to attack. Certain questions are asked as to procedure, and these questions will be answered in the next installment.)

[War Game, VI. The Decisive Attack. By Guido von Horvath. *Scientific American*, Apr 22, '16. 2500 words. Two maps.]

(Discusses the *enveloping* attack and the decisive attack by penetration. The problem illustrates an enveloping attack on one flank.)

[War Game, VII. The Decisive Attack, Enveloping Both Flanks of an Enemy. By Guido von Horvath. *Scientific American*, Apr 29, '16. 4700 words. Two maps. One diagram.]

(The general principles of a decisive attack are discussed, and the decisive attack by enveloping both flanks of an enemy is illustrated by the problem. One flank is encircled in the attack and the other flank is turned by surprise by a night movement.)

[War Game—VIII. By Lieut. Guido von Horvath. *Scientific American*, May 6, '16. 3000 words. Maps and sketch.]

(One of a series of tactical situations, treated in a simple way for the lay reader. This one shows the effect of the successful double envelopment.)

—Instruction and Training—Map Problems—Cavalry Patrols

[The War Game. I. A Strategic Reconnaissance of Four Cavalry Patrols. By Lieut. Guido von Horvath, formerly of the Austro-Hungarian Army. *Scientific American*, Mar 11, '16. 3800 words. Map and perspective sketch.]

(For the popular reader. Simple problem in cavalry patrols, touching upon duties, reports, etc.)

—Instruction and Training—Map Problems—Defense

[War Game, IX. The Defense. By Lieut.

Guido von Horvath. *Scientific American*, May 13, '16. 2800 words. Sketch maps.]

(Discusses the advantages and disadvantages of the defensive, and the selection and preparation of a defensive position along regular text-book lines. The author gives preference to trenches located at the foot of the slope. He presents a pen picture of the preparation of a position for defense, giving an idea of the method of performing the various tasks.)

—Instruction and Training—Map Problems—Outposts

[The War Game. II. Service of Security, on the March and at the Halt. By Lieut. Guido von Horvath. *Scientific American*, Mar 25, '16. 3500 words. Map and diagrams.]

(Covers in popular fashion the advance guard, rear guard and outposts. The problem is that of establishing outposts.)

—Instruction and Training—Tactical Problems—Outposts

[A Tactical Walk—Outposts. By Capt. William H. Waldron, 29th Inf. *Infantry Jour.*, Mar, '16. 7600 words.]

The second article of a series on the subject of tactical walks deals with a duty, the responsibility for which must of necessity be largely delegated to n. c. o's. The company commander who can issue orders for the establishment of an outpost and feel assured of the proper solution is, indeed, fortunate. This tactical walk must instruct along the lines destined to fit the n. c. o. for the duties he will be called upon to perform in war. The problem should be gone over several times, on different terrain. Then actually post an outpost with your company, preferably on the ground where you have previously conducted one of the tactical walks. Follow up by a maneuver of two companies, your own forming the outpost, the other acting as enemy. A tactical walk for the instruction of officers and men is undoubtedly the best preliminary to an efficiently conducted and valuable maneuver.

Success lies in the director; he must know his subject thoroughly, and be prepared to answer all reasonable questions. All tactical principles must be noted, and the problem should be solved by himself before starting.

For the n. c. o's., pads, pencils, compass and watch are needed. Typewrite the situation on 3 x 5 inch cards, one for each man. Place all cards of any one situation in an envelope so as to facilitate distribution when desired.

Every detail should be worked out before proceeding. Time used in studying the situation will be more than saved later on. In questioning the class, insist upon direct and exact replies. The director should make a key for himself so as to insure bringing out all principles.

A problem having been given, including the general situation, the special situation and the company commander's order for establishing an outpost, the n. c. o. class is taken to the supposed location of the outpost support. The director must endeavor to make the problem

**TACTICS—Continued**

realistic, and to start the class to using their imaginations for the purpose of visualizing, as it were, the various steps. Each member of the class receives a copy of the problem. The director explains in full, then allows a few minutes for individual study. Orders, their form, contents, scheme of composition, etc., can well be stressed here. Then ask at random for a statement of the military situation, repeat until all are familiar with the details. Now proceed to the line of outguards and distribute slips with the second situation, *e. g.*, for the first platoon say to move out to cover the posting of the outguard. Each *n. c. o.* will in turn represent the leader of the first platoon, and will write his solution. Several are read, the director explaining necessary points and inducing discussion where possible. He then collects solutions and passes them back, being careful to let no man have his own. Then follows the director's solution, given step by step. He will explain the need of a covering force, the methods that may be used, which one should be used and why, indicates the verbal order Sergt. A, the leader, would give, and applies all the principles to the solution of situation No. 2.

This solution is now impressed by means of questions and discussions of all points involved.

This same line of conduct is continued as far as time or capacity will permit. Do not attempt too much. Require brief but complete answers, orders, deductions, etc., in all cases. Develop directness of thought and expression.

(The original text gives procedure in very complete detail. It does not lend itself to condensation.—Ed.)

Other situations that may be developed in a tactical walk on outposts are:—the operations of a visiting patrol; the operations of a combat patrol; the preparation of the outguard positions for defense; the changes in the dispositions at night; the relief of the outpost; the preparation of a sketch showing dispositions of the outpost; the reception of a white flag; and the reception of deserters from the enemy.

All these and more may be woven into situations and taught to the class while conducting the tactical walk as hereinbefore stated.

**—Instruction and Training—Tactical Walks**

[A Tactical Walk—Patrolling. By Capt. William H. Waldron, 20th Inf. *Infantry Jour.*, Dec, '15. 6800 words.]

The tactical walk affords one of the best methods for instructing noncommissioned officers in the subject of minor tactics. The work may be carried on as a part of the company training. National Guard organizations can combine pleasure with profit by arranging for a Sunday tramp in the country.

The increased knowledge you will gain yourself, the great interest your men will take in it, the raising of a better *esprit de corps*, and the improvement in military effi-

ciency in your company, will not fail to convince you of the value of this training.

The ability of the instructor to impart tactical knowledge is the prime asset. Exercises must be studied out in detail beforehand. If possible, go over the actual ground with the same detail. The problem must be clearly and tersely stated. The several situations must follow in natural sequence. Each should bring out a tactical principle, to be illustrated to and impressed upon the members of the class.

Invite a full and free discussion of all points, but do not permit personal arguments among members of the class. Receive all their ideas, tactfully reject the bad. Never ridicule a solution.

In brief, as it is impossible to give here in full the excellent details of the walk, a problem in patrolling is given. Copies for each man are typewritten on 3x5 inch cards. A sufficient number of copies of the various situations is placed in envelopes, to be opened at the proper time.

The situation being given, each man becomes theoretically the patrol leader. Before advancing, the entire subject of patrols is to be brought out by the class. The strength, equipment, personnel, mission, formation and route, must all be correctly fixed. By varying certain features as (say) strength, the necessity of having sufficient men or the burden of superfluous strength can be illustrated. Require the proper equipment as laid down by regulations and requirements of the problem. Ask each man to explain the duties of the patrol leader. Give time, after turning out a situation, for the men to see it themselves. Do not go to another requirement until every man understands fully the preceding.

Situation 2 might be assumed to be the crossing of the outpost line. Required the action to be taken by the patrol leader.

After an advance of 800 to 1000 yards, situation 3 may require the patrol leader to stop and consider. Contact has not been gained. He is to be questioned on formation and terrain, and required to make a sketch. The director points out the steps in the process of patrolling, the tactical reasons for a patrol formation, and develops discussion of all important points.

An advance of a few hundred yards more brings forth situation 4, where the point is signalling to the patrol leader. Required the action of the patrol leader. Discuss signals, use of terrain, estimate of the situation,—the signal having meant the approach of a hostile patrol. Has this hostile patrol gotten any information? Shall a message be sent? Shall the capture be made? Shall they be allowed to pass? Ask every man, even to repeating the same questions, so as to be sure of instilling the correct solution.

Assuming that you have evaded discovery by the hostile patrol and have advanced to within sight of the hostile outposts, situation 5 requires action to be taken. The assumed position of enemy should be from 1200 to 1800 yards distant. Allow ten minutes for

study. Proceed to same minute discussion and instruction as exemplified for other situations. There is a boundless wealth of important detail to impress upon your men. Do not overlook or generalize without due consideration. The subject of messages alone may well receive here appropriate elucidation.

Situation 6 shows establishment of enemy's outposts, records firing in your own rear, and your sentinel signals enemy in small numbers. Required the action to be taken by patrol leader.

Situation 7 shows two returning hostile members of patrol of situation 4. What is to be done by patrol leader? An excellent opportunity is thus created to impress upon your patrol its mission, its position, its immediate object, with every different feature of the situation co-ordinated.

This walk can take up an entire afternoon, and will be about all that the average non-commissioned officer will be able to assimilate in one session.

This system is believed to be the best yet devised and if this article will induce a fair trial of the system, it will have served its purpose. Once used, it is believed all other methods will be discarded.

#### —Joint Operations—Army and Aircraft

See also

FIELD ARTILLERY—FIRE CONTROL—AERONAUTIC

#### —Joint Operations—Army and Navy

[European War. Echoes of, VI (continued). Combined Operations on Land and Sea. By José Paulo Fernandez, Capt. of Art., Portuguese Army. *Revista de Artilharia*, Dec. '15. 4000 words.]

(A brief mention of the principal combined land and sea operations, with special reference to the landing of the British expeditionary force on the continent, and the operations in the Dardanelles; preceded by a short historical sketch and followed by a résumé of the lessons to be learned by Portugal.)

[Combined Arms in War. By Arthur Pollen. *Land and Water*, Apr 13, '16. 3600 words.]

The most serious fact of the present naval situation is that the German submarine successes continue at the high level that prevailed last week. The casualties in vessels in the last three weeks, excluding the Mediterranean, have been 20, 25 and 22. Of this total of 67, 6 are allied ships, 26 neutral, and 35 British.

The submarines seem recently to have acted on the principle of sinking at sight, without utilizing gunfire or even appearing on the surface. Organization to combat such tactics must differ materially from that used during the milder campaign of last year. Armed force must be brought more swiftly to the infested spot. Unarmed yachts and launches are useless; their information will arrive too late. The control of the patrolling and attacking craft must be completely decentralized.

Sir Charles Monro's description of the evacuation of Gallipoli throws important light

on the art of using naval and military forces in combination. Throughout these operations the fleet entirely took the place of what, in land operations, would be termed the "lines of communication and transport." Never before have the two arms been combined on so important a scale. Never has combination been more successfully exhibited than in that final test of efficiency, the successive evacuations of Suvla, Anzac, and Helles.

Opinions differ as to proper strategic use of the air service. Those favoring a force entirely free from naval or military control maintain that "command of the air" is as necessary as "command of the sea," and this cannot be secured by a service under divided control. The conclusion is erroneous. Except for military purposes, no use is made of the air as an element at all, and the ultimate object of the air raid is to assist the army or navy either directly or indirectly.

Air raids are not more efficient, because an aircraft bomb has not destructive capacity sufficiently great to compensate for lack of precision in its use.

The accessory use of aircraft is proved by experience to be absolutely indispensable always to the army and sometimes to the navy. The utility of aircraft in making raids of decisive military value is yet to be shown.

See also

LANDING OPERATIONS

#### —Machine Gun

See also

MACHINE GUNS—SERVICE REGULATIONS

MACHINE GUNS—TACTICS

#### —Night Operations

[Night Warfare. *The Army and Navy Gazette*, London, Mar 18, '16. 200 words.]

Much valuable and independent testimony has been received as to the importance of Lieutenant-Colonel W. A. Tilney's little book on "Marching and Flying by Night." One officer writes that in a fortnight most of his men have learned the system and that it has increased their fighting efficiency to an enormous extent. It is believed that no one in past times has made of the heavens a time-piece and compass by means of the first magnitude stars, thus becoming able to move about with ease and accuracy on a star-lit night.

This is a discovery of the utmost importance at the present time, and the more quickly it becomes generally known the more lives will be saved by both land and sea. It will revolutionize night movements and has already led to the invention of the Anipace Compass which has just been adopted by the Inventions Board. Praise for Colonel Tilney's book has been received from all over the world, but no adverse criticism of any kind has been received.

#### —Tactical Units

See also

BRIGADE—TACTICS

#### —"TANKS"

See

AUTOMOBILES—ARMORED

**TANNENBERG AND ANGERBERG,****Battles of**

[Tannenberg and Angerberg. By Captain Hans Niemann, German Army. Extract from Hindenburg's "Siege bei Tannenberg und Angerberg." *Infantry Journal*, Mar, '16. 5000 words. Sketches.]

War is the last resort of diplomacy for the purpose of securing the vital interests of a state. The military forces of both parties are employed to this effect, and the duty of the commander is to destroy the opposing forces. A defeated army can reorganize and again become a factor, so that defeat is but partially fulfilling the purpose. To completely fulfill the purpose of a battle, the entire hostile army must be dead, wounded or taken prisoners, and its war material destroyed or captured.

All great captains have striven to attain this object. Schlieffen has demonstrated in his brochure on "Cannae" that all the great destructive battles of history from Hannibal to Moltke can be traced to the plan of Cannae. Complete destruction of the enemy is to be attained only by surrounding him.

At Cannae, Hannibal surrounded and destroyed a hostile Roman force two-fifths greater in numbers, with a loss of only one-eighth of his own force. Hannibal's strategic dispositions are and will remain models for every battle of destruction. In detail as follows:

1. A center of at least the same frontal depth as the enemy sufficient to occupy the hostile front and to make an attack.

2. Two enveloping wings of the greatest possible strength.

3. To attack with wings only after the enemy has sent in his greatest forces against the center. The movements of the wings must be masked. The best and quickest way to attain this end is for the center to yield slowly. The enemy will press after and fall into the cul-de-sac. Any considerable advance on the part of our center is to be avoided. Which party attacks first is immaterial, but the first attack must be carried out by or against the center.

These conditions generally require superiority on the part of the enveloping force; not necessarily so, however. Schlieffen was of this latter opinion, and is shown to have been correct by the battles at Tannenberg and Angerberg. Frederick the Great at Leuthen, during the Seven Years' War, was the predecessor of Hindenburg, at least in the attempt to envelope a strong wing with inferior numbers. Two things to be learned from Leuthen are that an enemy greatly superior in numbers can be forced to commit the error of Terentius Varro (the Roman commander at Cannae) and also that inversely the only salvation for an enemy in case of envelopment of even one flank is an immediate retreat. Both propositions are strikingly demonstrated by the German campaign in East Prussia, which up to the middle of September, 1914, was decided in our favor under the brilliant leadership of Hindenburg.

Two Russian armies were operating against East Prussia; one from the north, the other from the south. Hindenburg's task was to inflict a destructive blow with a strength of not even one-third of that of the two main Russian armies. In all history, no similar task has ever been imposed upon a commander.

The southern army was the more dangerous; also the junction of these two armies must be prevented. Napoleon was in a similar position in June, 1815, when he had separately to defeat Wellington and Blücher. He recognized his task, but by dividing his army failed to destroy Blücher, simply compelled him to retreat.

Hindenburg withdrew troops from in front of the northern Russian Army under Rennenkampf, and planned to lead the Russians to commit the "error of Terentius Varro." The woods and lake country lying behind the Russian line was to assist in the carrying out of his plan. The nature of the terrain chosen by Hindenburg caused this Russian army of about 230,000 to advance on a front of 30 km. Then the enveloping movements were commenced (full details in original text.—Ed.), and six days later the Narew Army was destroyed. It did not retreat while there was yet time, but continued on into the enveloping jaws. The greatest battle of destruction in history had been fought. 135,000 men had destroyed 230,000, themselves losing not over 15,000.

Meanwhile the northern Russian army was closer to Königsberg, Hindenburg prepared to attack. Rennenkampf, however, was on a frontage of 120 km., so Hindenburg chose the attack of Frederick the Great at Leuthen, viz., to envelop the hostile left wing. Again Hindenburg, aided by his knowledge of the terrain, contrived to have the Russians take up a line with a wooded district in rear. The envelopment and destruction of the left wing succeeded, but the main Russian Army retreated. The ratio of strength of Germans to Russians was about 2 to 3. The timely retreat cost 60,000 men and 150 guns, but saved the army. Hindenburg in this campaign of scarcely three weeks, had defeated two hostile armies, each twice greater than his own, inflicting a total loss of 250,000 men and 650 guns, the artillery of 6½ Russian Corps. The highest qualities of the art of troop-leading were shown to be embodied in this greatest commander of history—Hindenburg.

**TARGET PRACTICE**

See also

COAST ARTILLERY—TARGET PRACTICE  
NATIONAL GUARD (U. S.)—INSTRUCTION  
AND TRAINING—TARGET PRACTICE

—Infantry

See

INFANTRY—FIRE—INSTRUCTION AND TRAINING

**TARQUI, Battle of**

[The Thirty Days' Campaign. Editorial. *Memo. Estado Mayor* (Colombia), June, '15. 2800 words.]

Report of the battle of Tarqui by Antonio José de Sucre to the Secretary of State for War, Republic of Colombia, Mar 2, 1829, and covering the operations from Jan 28, 1829, to Feb 27, 1829.

The Colombian forces consisted of 3800 infantry and 600 cavalry. The Peruvians, commanded by Gen. Le Mar, numbered 5000 infantry with cavalry and artillery.

After several weeks of maneuvering for advantage of position, the Peruvians were encountered established on a high hill with a deep ravine in front which could only be passed in column of files. On the right of the position the ground was steep, broken, and very difficult. On the left was a dense wood through which passed a narrow defile leading to Giron, and which gave to the locality the name of "Portete de Tarqui." The Colombians approached the position after a night march with the intent of a surprise attack at daylight, but in the darkness the cavalry of the advance guard strayed into the hostile lines and came under a heavy fire, other troops sent forward hurriedly to support the cavalry became disordered in the darkness and opened fire on each other. With the coming of daylight the main attack entered the wood on the left which the enemy, believing impassable, had not occupied. The fighting soon became general and culminated in a charge by the Colombians along the entire front. The Peruvians fled and at seven o'clock the battle was ended. Many prisoners were taken in the pursuit, and the Peruvian losses amounted to 2500. Colombian casualties were 54 killed and 200 wounded.

Negotiations following the battle resulted in a treaty which terminated the war.

## TELEGRAPHY

See also

### WIRELESS TELEGRAPHY

#### —Field—Apparatus and Equipment

[Some Useful Suggestions for Engineer troops. By Lt. Col. Juan B. Iturbide, Argentine Army. *Revista Militar*, (Argentina), Jan, '16. 1000 words. Illus.]

(List of necessary articles of equipment for field telegraph, to be carried in the reel wagons of the telegraph company.)

## TELEPHONY

See also

### FIELD ARTILLERY—FIRE-CONTROL—INSTRUMENTS AND EQUIPMENT—TELEPHONES

#### —Field Exchanges

[An Improved Telephone Exchange. By Lieut. W. P. K. Warren, R.G.A. *Jour. Royal Artillery*, Feb, '16. 300 words. Illus.]

A description is given of a battery telephone exchange improvised from scrap materials on hand and such as always can be obtained. The exchange takes care of eight lines, viz.: three observing posts, artillery brigade headquarters, the other battery of the brigade, the infantry battalion headquarters in the trenches, the officers' billets, and the other section of the battery.

The materials are brass strips cut from an 18-pdr. cartridge case, old terminals from

worn-out dry cells, and a base board, about eight inches square, of well seasoned wood soaked in candle grease.

## TELEPHONE

### —Switchboard

[An Improved Telephone Switch-board. By Major G. K. Gregson, R. F. A. *Jour. Royal Artillery*, Nov, '15. 750 words. 1 diag.]

A description is given of an improvised telephone switch-board, devised to meet the necessity of taking care of a greater number of lines to the principal observing station than could be managed with available instruments. A switch-board and exchange became the only possible solution.

The switch-board was made from metal cut from an 18-pdr. cartridge case screwed to a board by screws from an ammunition box. The plugs were .303 rifle cartridge cases. Fuse pins and some pieces of wire completed the equipment. The board took care of five stations.

## TELESCOPES

See

### PERISCOPES

### RANGE-FINDING—INSTRUMENTS

## TENTAGE

### —Pitching and Striking of

[Tent Pitching Drill. By Captain Marco A. Pardo, Tactical Officer at the Military Academy. *Mem. Estado Mayor* (Colombia), June, '16. 1680 words.]

(A detailed article, based on notes taken from the experience gained at the Colombia Military Academy and from the work with troops; covering formations, commands, inspections of equipment, digging of trenches and other operations incident to the pitching of tents by a company of infantry.)

## TENTS

[Passing of the Tented City. How the Aeroplane Scout Has Affected the Military Camp. By Edward C. Crossman. *Scientific American*, July 1, '16. 2000 words. Illustrated.]

The use of canvas by an army is determined by local conditions and customs. The United States army uses canvas extensively, because of the lack of houses for billeting and on account of our repugnance to that form of invasion of the home. In Europe the conditions are different, and in the German army no shelter tent is carried.

The question of sheltering an army under canvas takes on a new significance on account of aerial reconnaissance. No longer will the white or khaki tent suffice. On account of shadows, a regular arrangement must be avoided. So we may picture the camp of the future, with mottled or parti-colored canvas, arranged as much as possible under cover of natural objects, irregular in arrangement and spread over much more ground than was formerly necessary. Instead of 400 acres, a brigade will occupy 600 to 1000 acres.

## TETRA-NITRO-ANILINE

[Tetra-Nitro-Aniline (T. N. A.). By Lt. W. W. Bradley, U. S. N. *Proceedings Naval*

**TETRA-NITRO-ANILINE—Continued**

*Institute*, Mar-Apr, '16. 1800 words. Tables.]

As the strongest explosive compound known, this explosive calls for attention. It is a tetra-nitro derivative of aniline, prepared by the action of a mixture of nitric and sulphuric acids upon meta-nitro-aniline, is formed in yellow crystals the size and hue of which vary with the method of preparation, and melts with decomposition at  $216^{\circ}$ - $217^{\circ}$  C. If heated quickly it will decompose at a lower temperature, but in any case its decomposition under heat alone is never explosive. It has a specific gravity of 1.867, is practically insoluble in water at ordinary temperatures, slightly soluble in benzene and chloroform, and more so in acetic acid, nitrobenzene, etc. A neutral compound, it shows no action on metals; when pure, its stability is excellent. Its brisance is high, about 1.5 times that of T. N. T. Its sensitiveness to shock is greater than that of T. N. T., and it is very sensitive toward fulminate detonators.

Only experiment will tell whether T. N. A. can be usefully substituted for other explosives. It will not serve as a bursting charge, because it is too sensitive to shock. It cannot be melted and poured into a shell cavity, but it might be used as a bursting charge for mines and torpedoes. For this sort of work, its brisance, inertness in respect of metals, ease of detonation, etc., would seem to recommend it. These qualities would be useful in aeroplane bombs. Its employment in fuses and detonators would do away with the necessity of a priming charge of either tetryl or picric acid.

It has, however, one grave defect: its readiness in the unmodified state to decompose in the presence of moisture, even at ordinary temperatures. From experiments made by the Naval Bureau of Ordnance, the conclusion is drawn that in spite of the advantages set forth above, the explosive force of T. N. A. is not greater than that of T. N. T., whose suitability as a military explosive is well known.

**TOPOGRAPHY, Military**

*See also*

CHILE—MILITARY TOPOGRAPHY OF  
FRANCE—MILITARY TOPOGRAPHY  
MAPS AND MAPPING—MAP READING  
SKETCHING

**TORPEDO BOAT DESTROYERS**

*See*

DESTROYERS

**TORPEDOES**

—Aerial

[The Buck Automatic Aerial Torpedo. *Aerial Age Weekly*, June 26, '16. 300 words.]

A new automatic aerial torpedo, having a range of action over land or water of thirty miles, consists of a torpedo body, containing the engine, explosive, and timing mechanism, suspended from an aeroplane in such a way that it can be automatically released when desired. The flight of the aeroplane is controlled by automatic machinery.

—Defense Against—Constructional

[Torpedo-proof Battleships. From *Naval*

and *Military Record*, of London, Feb 2, '16. *Army and Navy Register*, Feb 26, '16. 450 words.]

The Navy Department of the United States is very favorably situated for learning whatever lessons the naval war may teach. It is the only one of the seven great naval powers whose naval attaches are on duty in England, Germany, Austria-Hungary, Italy and Russia, due to the fact, of course, that the other six great powers are themselves engaged in the war.

To this fortunate circumstance may probably be traced the energy which the United States Navy Department is revealing in carrying on the work of strengthening its fleet. Of the problems confronting them in this work, the most important and absorbing seems to be that of finding means for rendering large armored ships proof against the torpedo. Research has been carried on for some months past with a view to discovering an effective means of protecting large ships against torpedo attack, and it is now stated that a method has been evolved.

No details have been published as to the means to be adopted, but it is stated that the ships which it is hoped to lay down this year, having incorporated in them this new means of protection, will be able to survive a blow from at least a single torpedo.

—Naval—Direction of

*See*

HAMMOND TORPEDO

**TRAILERS**

*See*

MOTOR TRANSPORT—TRAILERS IN

**TRAJECTORY**

[Methods for Determining the Point of Fall in Artillery Ranging (Target) Practice. By Lts. R. Götherström and W. Weibull, Royal Coast Artillery. *Svensk Kustartilleritidskrift*, Vol. II, Part 1, '16. 18 pages, with many formulas and computations.]

*See also*

BALLISTICS

**TRANSPORTATION**

*See*

SUPPLY AND TRANSPORT

**"TRENCH-FOOT"**

[English Sidelights on the War. From English newspapers. *N. Y. Evening Post*, Dec 30, '15. 100 words.]

It was stated in the House of Commons that 770 cases of trench-foot had been reported from France and Flanders during the week ending Nov 27. Rubber thigh boots in great numbers have been provided for the men actually in the trenches, but they were apparently in some cases not used until the trouble had set in, after which they were worse than useless.

[Winter, 1915—the Period of Icy-cold Water Which Produced "Trench Foot." *Sphere*, Jan 1, '16. 250 words. Illustrated.]

The winter months of 1915,—January to April and November and December,—produc-



ed a new disease which became known as "trench foot." This disease, at first erroneously called frost-bite, is induced by damp cold, generally above the freezing point. Actual degrees of frost are not necessary to produce it. The men began to pour into the hospitals in France in Feb and Mar. Some had pale feet, others purple. Sometimes blisters occurred, sometimes gangrene and tetanus, though the latter were fortunately rare.

The best treatment for the disease was immediately sought. It was found that "trench foot" was due not alone to damp and cold, but also to the inaction necessarily imposed by the boggy ground of the trenches. In the treatment, warmth has been found beneficial in the later stages. Mainly prevention is relied on. A warm layer of air between the foot and the outer covering is necessary to prevent the disease. An oiled silk stocking should be worn next the skin, and looser boots and loosened putties are necessary in the trenches.

## TRENCHES

See

ENTRENCHMENTS

## TRIPOLI

—Italian Operations, 1911-13

See also

CYRENE

## TRUBIA STEEL WORKS (Spain)

See

MUNITIONS — MANUFACTURING FACILITIES  
OF—SPAIN

## TSINGTAU, Siege of

[The Charge Against the Central Works at Tsing Tao. Anonymous. *Kaikosha Kiji*, Sept, '15. 5000 words.]

After the beginning of the general attack on October 30, the Emperor's official birthday, the 56th Infantry, with the 2d and 3d battalions in the first line, had gradually advanced until on the night of November 5 they occupied a position within ten meters of the ditch of the works and were waiting for orders to charge. That night the engineers constructed two roads about five meters wide over which to advance. Upon recommendation of the commander of the 3d battalion, transmitted through the regimental commander, the division commander ordered the charge, and it began at 1 a. m., resulting in the capture of the works. A second detachment followed closely, and securely held the position. Thereafter, the regiment, regardless of rifle and artillery fire, charged the batteries on Mount Bismarck and another mountain, and at daybreak completely occupied the position.

### Preparations for the Charge

At about 7 p. m., Oct 6, 1914, the leader of the first charging party, Second-Lieut. Nakamura, received orders from Major Nakashima to report at battalion headquarters. He at once assembled his squad leaders and gave the following orders:

1. Uniform: Light order. Leave off knapsacks, put one day's ration of toasted bread in

the packs, carry canteens and haversacks, wear as clean underclothes as possible, leave behind handbooks, diaries, etc., and all men will tie a white band around the left arm.

2. Arms and equipment: Rifles, bayonets, intrenching tools, and 210 rounds of ammunition per man.

3. I will carry a white flag, and each man will carry a national flag made during the time we have been confronting the position.

He then went to battalion headquarters, where he received instructions and all information at hand about the fort. A sergeant and 20 men from the engineers and 3 sergeants and 3 lance corporals especially selected from the 3d battalion, were attached. He was furnished with 30 hand grenades and a field signal lantern. He was also informed that our artillery would cease firing during the charge, but that it would open up on the enemy during pursuit; that an infantry squad and two bomb guns would provide protection from hostile positions to the north and west, and that the battalion and regiment would be in position ready to advance at the proper time.

He then returned to his platoon, gave instructions in handling the hand grenades and in the use of the signal lantern, and addressed them as follows:

"It is very essential, but most difficult, for military men to find a fit place in which to die. That we have been selected from the entire enveloping army to charge and capture the central position is a great honor, and, for military men, is a chance to die difficult to obtain a second time. Since our departure from Japan we, of course, have always had the resolution to do or die. It is considered a disgrace for military men to die of disease during a march or while besieged. Therefore we pay great attention to sanitation and avoid exposure to hostile eyes and guns, because we want as many bayonets as possible on occasions as this.

"To-night I will offer my life to the Emperor. Life or death is ordered by Heaven and is beyond the power of man. To meet death composedly when it comes is the special characteristic of our country's warriors. This platoon must capture the central fort to-night, regardless of circumstances. Ground once captured must not be yielded even an inch. If I fall, the squad leader takes my place; if he falls, the lance corporal takes command; if he falls, all must co-operate and fight furiously even to the last man. Rifles will not be loaded, because as soon as we see the enemy, we must jump at him with our bayonets. As soon as we meet the hostile machine guns, the hand grenades will be thrown and we will charge just as they explode. The men carrying them will advance at the head of the platoon. Volunteers for this duty will report to me."

As one man, the entire platoon stepped forward. Ten were selected, and each one put three grenades in his outer pockets. Then the company commander, in a most serious voice, said: "If this detachment should fall into desperate circumstances, I could never stand

**TSINGTAU, SIEGE OF—Continued**

by and see it die alone, but would come to its aid with the remaining two platoons."

The battalion commander's address: "His Majesty looks upon the military as his right-hand men. Often since the beginning of this war he has sent his aide-de-camp to announce his gracious imperial will. This is the one stroke that will throw splendor on our flag, and, if you are brave and faithful, I do not doubt your splendid success under its divine protection."

Upon instructions from the company commander, they faced in the direction of the Imperial Palace, presented arms with fixed bayonets, and then marched off without uttering a sound.

At the position from which they were to charge, he assembled his non-commissioned officers and his two squads of engineers and gave the following orders:

"1. I command an infantry platoon and 2 squads of engineers, and I plan to charge the central fort at 1 a. m. to-morrow.

"2. An infantry patrol of 5 men with hand grenades, one squad of engineers, 2 scouts, and the 1st, 2d, and 3d infantry squads will form the right detachment, advancing by the right road. An infantry patrol of 5 men with hand grenades, one squad of engineers, one scout, and the 4th, 5th, and 6th infantry squads will form the left detachment and advance over the left road.

"3. The infantry patrols will advance with the engineers leading, and when the machine guns are met they will throw the grenades and charge.

"4. The engineers, as soon as the infantry occupies the fort, will dismantle all mechanical devices and turn them over to the infantry.

"5. The scouts will seek out and report the positions of the enemy, their outer defenses and mechanical devices.

"6. The remaining infantry will cross the ditch by means of ladders, one to each squad. Upon reaching the parapet, the right detachment will form line to the left, and the left detachment to the right, without interval between detachments.

"7. Lance Corporal Shima, as soon as the parapet is occupied by the platoon, will, facing the rear, make a signal to the right, left, up, and down, with the lantern. Then, if the parapet is successfully held, he will signal by waving the lantern in a circle. Before starting, he will connect up the electrical battery.

"8. I will be with the right detachment. Lance Corporals Okata and Yashima and 1st-class Private Ikeda are detailed as orderlies."

Each leader was required to repeat his orders, and all watches were set. Promptly at 1 a. m., the ladders were lowered, the ditch crossed, and the detachments arrived under the enemy's parapet, of which Lance Corporal Shima was immediately informed by signal. Both detachments were about to form line, but everything was so quiet inside the fort that omitting to do so did not seem risky, and they proceeded in column formation towards the fort at right angles to the line of fire. They

arrived at the gorge and occupied the shelter trenches there, stationed a patrol of one non-commissioned officer and ten men with hand grenades near the outside of the gorge to protect against counter attack and blocked all entrances to the enemy's bombproof shelter, which by this time they had discovered. Due to confusion among our detachments, our men's voices calling to each other were heard by the enemy outside the central positions, and they poured into us a fearful rifle and machine-gun fire, especially on our right. The leader ordered a squad to charge the machine guns, which was done and the machine guns withdrew to cover.

During this time, the engineers had cut all telephone wires and located and forced their way into the telephone station. The enemy inside resisted with pistols, but our infantry overcame them with the butts of their rifles and stopped any further telephoning. All lights in the fort were extinguished.

About this time, the company commander came up with the two remaining platoons, stationing one at the gorge and sent the other into the bombproof shelter. The confusion of the enemy inside, clothed as they jumped out of bed, is difficult to describe. They immediately surrendered.

Under orders from the company commander the leader of the first charging party, Second-Lieut. Nakamura, then gave the necessary orders for receiving the surrender of the fort.

Later, we learned that the hostile sentinel had at first thought we were only a small patrol and learned his mistake too late.

[The Capture of Tsing Tao, Aug.-Nov. 1914. From Japanese Sources. By Nakaba Yamada. *United Service Mag.*, Dec, '15. 9000 words. 4 sketch maps.]

On the 2d Sept the first Japanese transport arrived at Ryuko, on the north side of Shantung Peninsula. A violent storm delayed landing for ten days. The long march of this force, the northern army, to reach Tsing Tao was attended with terrible hardships due to the havoc caused by the storm in destroying bridges and making a lake of the plain of Shantung. On the 13th the German town of Kiao-chao, on the railroad along Kiao-chao bay leading to Tsing Tao, was reached and occupied. About the same time the southern army landed at Rozan Bay, to the north and east of Tsing-Tao; and later, on the 23d, the English troops under Gen. Bernardiston, landed on the same spot. The Japanese navy now took up its position six miles off Rozan Bay. By the end of September the two Japanese armies and the English troops had completed landing.

The German territory was in the shape of an isosceles triangle with Tsing Tao at the angle pointing towards the sea and the allied forces along the opposite base. Three rivers flowing parallel to the base roughly divide this triangle into three parts; the Hakusa, the Rison and the Kaihaku rivers. From the base of the triangle along the Hakusa river and in the territory extending to the Rison river

lay the German first line of defence in a series of fortified hills. On the Tsing Tao side of the Kaihaku river was the second line of defence. It consisted of ten principal forts, their front embellished by mines, wire entanglements, and abattis. The last line of defence was still closer to Tsing Tao and contained five strong forts, Moltke, North Bismarck, South Bismarck, West Itlis and North Itlis. Several seacoast fortifications protected the Kiao-chao bay front of the colony. The Germans are said to have spent \$30,000,000 on the defences of Tsing Tao.

The northern army under Gen. Yamada became the right wing of the attacking line and the southern army under Gen. Horiuchi, the left wing. The attack on the first line began on the 26th Sept. The center of the line proved the strongest, but this part was taken by a flank and rear attack of the left wing during a diversion by the right. The German ships in Kiao-chao bay inflicted heavy losses on the advancing right wing. On the 28th the Japanese faced the second line of defence on a frontage of about twelve miles. This second attack was co-operated in by the Japanese air corps and the Japanese and English navies. On the night of the 28th, after an unsuccessful night attack on the Japanese position on the hills opposite the right flank of the second line, the Japanese followed up the retreating Germans and captured the Fuzan fort on a big hill protecting the last lines of defence. The next and third stage of attack may be called "the siege of Tsing Tao."

The Japanese forces as they now confronted the last and strongest German line, had their line broken by the Kaihaku River. They immediately entrenched, awaiting the arrival of heavy siege guns. Their duty was, first, to maintain their position; second, to watch the enemy's movements; and third, to wear out the enemy. The allied forces at this time were divided into three parts, the right and left wings, and the center. The German batteries kept up a continuous bombardment, firing from 2500 to 3000 shells per day.

On the 10th Oct, a section of the Japanese navy bombarded and destroyed a battery of the Itlis fort on the right flank. Again on the 14th, the allied navies bombarded the Kaihaku fort with considerable damage. With this the navy gradually increased the pressure on Tsing Tao and became a very potent factor in the siege. The transportation of the heavy siege guns was a difficult procedure, as practically all the roads had to be constructed. These guns arrived about the middle of Oct.

The Emperor's birthday, the 31st Oct, was fixed for the general attack by the Japanese. At 6:15 a.m. the bombardment began, and was taken up by the whole artillery line and both the Japanese and English navies. The German batteries answered with gusto. At seven o'clock the report came that the Germans had set fire to the shipyards, coal and oil stores, and other public buildings. But by the second

day of the bombardment, the infantry of the center crossed the Kaihaku river, and on the fourth day the extreme wing also was able to cross. Gradually the shells of the heavy Japanese naval siege-guns smashed the German forts that held back the advance of the infantry. The batteries of the front line forts were practically silenced, but there were other strongholds behind these.

Just after midnight on the night of the 5th-6th Nov, the general attack was begun by General Yamada leading a company of engineers against the enemy's center. The charge was taken up by the whole line. It was irresistible. Line after line carried it along into the enemy's works, and by 7 p. m. the principal line of German defence was occupied. Preparations were immediately made to advance on the remaining defence works, but at seven o'clock the next morning the Germans surrendered. The German commander in his report to his emperor, gives his reasons for surrendering as "exhaustion of our ammunition and the great damage caused to our fortifications by the Japanese shells."

[The Siege of Tsing-Tau. By Major Herrera de la Rosa, Military Attaché, Tokio. *La Guerra y su Preparación*, Madrid, July, '16. 15,000 words. Illustrations, maps and plans.]

The significant parts of this article cannot be abstracted without the reproduction of the maps and plans. The following subjects are considered:

- (a) Enumeration of the forces engaged in the siege—37,500 Japanese, 1300 English.
- (b) Manner of bringing the contingents up to war strength.
- (c) Transport of forces to the theater of operations.
- (d) Summary description of this theater.
- (e) Development of operations.
- (f) Official report of the general commanding the besieging forces.
- (g) Official documents relating to the fall and to the capitulation of the place; Imperial rescript to the forces engaged, and acknowledgement made thereof.

Plans and sections of various German works are given, as well as a map of the Japanese approaches against two of these works.

## TUBERCULOSIS

[Consumption in the Army. *Army and Navy Gazette*, London, Feb 29, '16. 500 words.]

Out of sixty soldiers recently discharged from a London Hospital as unfit for further military service twenty-two were suffering from chronic pulmonary tuberculosis. These men never suffered from lung trouble before the war. Also it has been recalled that in the late seventies and early eighties there was more lung trouble in the Brigade of the Guards, despite their superior physique, than in the regiments of the Line. This was due to the great amount of night duty performed by the latter. It is therefore believed that the continued night guard duty under trying

**TUBERCULOSIS—Continued**

service conditions has aided the development of tuberculosis.

However, the English Medical Department does not accept this view, and the soldiers so affected are in danger of being discharged with no pensions or other pecuniary help from the government.

**TUMP LINE**

See

INFANTRY—EQUIPMENT—PACK

**TURKEY****—Army**

[The Turkish Soldier. By M. Zeki. *Rev. del Circulo Militar*, Sept, '15. 1500 words.]

France and England announced to the world that the troubles of the Turkish army in the Balkan War showed the failure of the German military instruction. Quite different were the conclusions of our own (Turkish) military authorities. They laid the blame on the following causes:

1. We were not prepared for the war.
2. Our service of supply was defective, and
3. There were many officers who were not capable of their duties in a modern war.

The reorganization of the corps of officers was accomplished for the Army by Enver Pasha. Also the German military commission, nominated to assist the ministry, received enlarged powers.

Djemal Pasha was given the portfolio of the Naval Department. As soon as he saw the incapacity and ill intentions of the English instructors, he took immediate steps to replace them by a German naval mission.

To-day the army and the navy are on the same footing. For this credit must be given to the two chiefs who have organized the national defense, in accordance with actual necessities and modern ideas, on a new and solid basis.

**—History**

[Decrepit Turkey and Young Turkey. By Gen. Pietro Citati. *Riv. Mil. Italiana*, Aug, '16. 6000 words.]

The Young Turk revolution burst forth suddenly July 23, 1908, while the European powers were watching events in the Orient. At first the reports were not believed, but the event proved to be a real revolution. The mystery of the occurrence was not dispelled as time passed, and on April 13, 1909, came the unexpected counter-revolution.

If we study the causes of this revolution, we find that one of the principal causes was Abdul Hamid, the "Red Sultan." His reign began in blood and ended in blood. He did nothing to avoid the war with Russia which robbed his empire of its finest provinces. His only thought was for the preservation of his own life and power by arbitrary and cruel proceedings that bred in his subjects the spirit of anarchy and rebellion.

The Young Turks, scattered through Europe and the vast expanse of the Turkish Empire, formed a powerful secret society called the "Committee of Union and Progress." The

society maintained contact with Europe; in fact, it was the question of reform in Macedonia that led to the formation of the society. In 1904 Europe imposed upon Turkey 25 officers to reorganize the Macedonian gendarmerie. In 1905 the number was doubled. In 1906 financial control was imposed, and in 1908 judicial control. All these measures resulted in inspiring the profound respect of the people they were intended to serve, and laid the foundation for the revolution.

The society had its headquarters at Salonika, but it spread to many localities and among many races. The Sultan's spies swarmed through Macedonia and discovered the workings of the society. The Young Turks then resolved to take the offensive. On the night of July 22, 1908, the central committee in Salonika seized the telegraph office and sent telegrams to various committees instructing them to proclaim the constitution the following day. In Salonika this was done with elaborate ceremony.

Scarcely had the constitution been proclaimed when the committee telegraphed to the Sultan suggesting that he approve the constitution within 24 hours. After much hesitation he consented. One by one, important concessions were wrung from the Sultan, and he was forced to constitute a new government under the head of Said Pasha, who was a liberal although he had been a member of the deposed government.

The committee went to Constantinople and dealt with the Sultan directly. It arranged for the appointment of an upper house and the election of a lower house which should adopt the constitution. It effected the discharge of 30,000 spies employed by the Sultan and reduced him to the state of a prisoner.

On Apr 13, 1909, Constantinople awoke in full revolt and became the scene of a desperate struggle between the troops loyal to the committee and those of the Sultan. The uprising was brought about by three classes: the population of Constantinople, which had been deprived by the committee of certain privileges formerly enjoyed; the officials that had been thrown out of employment by the committee; and the educated class, formerly exempt from military service but now forced to serve.

The committee received the support of all Macedonia, a large part of the army, and many important elements of the population of Constantinople. It withdrew to Salonika and sent an ultimatum to the Sultan, demanding that everything be restored to its previous status. A military force was collected, which marched to Constantinople and captured it on Apr 24. The result was the deposition of the Sultan and the accession of his brother, 63 years old. Thus began the undisputed dominion of the Young Turks.

Many widely varying judgments have been passed upon the part played in these occurrences by the "Committee of Union and Progress." By some it was lauded to the skies, and by others condemned without measure. Without attempting to decide this dispute, let us ask one question. If at the close of the

present war Constantinople is lost to Turkey, who will be to blame if not the Young Turks who have betrayed their country to Germany?

See also

CRIMEAN WAR  
DARDANELLES  
EUROPEAN WAR

## TURRETS, Armored

See

FORTIFICATIONS — PERMANENT — ARMORED  
TURRETS

## TYPHOID

[Typhoid Inoculation. *Army and Navy Gazette*, Jan 22, '16. 100 words]

According to a statement of Mr. Tennant in the House of Commons, there were up to Nov 10, 1915, 1365 cases of enteric fever among British troops in the western theater. In 579 cases of inoculation there were 35 deaths, and in 571 cases not inoculated there were 115 deaths. Thus the value of inoculation is proven.

## TYPHUS

See also

EUROPEAN WAR—DISEASES IN

## UNIFORMS

### Canada

[Note. *Army & Navy Jour.*, July 8, '16. 100 words.]

Kilts are to be discarded by the Scottish contingent of the Canadian overseas forces, as not being suitable for trench use in cold and rainy weather. The balmoral will be retained instead of the regulation cap as a distinguishing mark.

### —Germany

[Notes on the Changes Made in the German Uniforms. By Paulo Emilio Escobar. *Mem. Estado Mayor* (Colombia), May, '16. 1000 words.]

The writer enumerates the principal changes made in German uniforms pursuant to imperial decree of Sept 25, 1915. At the same time, he reviews the colors adopted by the principal powers of the world for their field uniforms.

Recommendation is made that a commission be appointed to study the subject of uniforms most appropriate for the Colombian army, in view of the special topography, tropical climate of the greater part of the country, and special conditions on account of dry and rainy seasons, and probable fields of operations.

### United States

[The Uniforms of the American Army. By Col. Asa Bird Gardiner, U. S. A., retired. *Magazine of History*, Aug-Sept, '15. 14,000 words.]

The question of preparedness being of great interest at the present time, it is thought that an account of the uniforms worn at different periods by our Army will be timely.

The "blue and buff" of the Revolution can be traced to the army of Gustavus Adolphus of Sweden. They became the English "Whig"

colors, typical of the British struggle for constitutional liberty, and naturally were adopted by the American Whigs. This uniform was worn by Colonel George Washington's Virginia regiment of foot in 1756-1763. It is to be understood that during what may be called the formative period, say up to 1800, there was no uniformity, so far as distinctive clothing is concerned, among the various American bodies of troops. Leather outer garments, homespuns, bearskin hats, moccasins, mixtures of uniform and civilian dress, scarlet coats of the English, in fact all sorts and conditions of material, even to woolen blankets and comforters draped over the shoulders.

The line of similarity which the lapse of years permits us to trace ultimately arrives at the uniform of to-day. The "blue uniform" is of still earlier date, a militia artillery company of 1738 being called "the blue Artillery Company." A New Jersey force in 1755 operating at Fort Niagara was known as the "Jersey Blues" from the uniform of blue coats, faced with red, buckskin breeches and gray stockings.

A New York Militia Artillery Company had in 1772 a uniform which subsequently became that of the regular American artillery, viz: "Dark blue, with red facings and red linings, white waistcoat and breeches, black half gaiters and gaiters."

Eventually after the Revolution had progressed a few years, "blue" became the prescribed color for the coats of the American Army. This is undoubtedly due to the fact that it had been the insignia of the Whigs, the Covenanters having adopted that color from the history of the ancient Israelites, who were enjoined to put upon the fringe of their garments, a ribbon of blue. The particular shade of blue adopted for the Army was known as "Dutch blue" as appears from bills rendered by Philadelphia tailors of the period.

This uniform of course did not spring full-fledged into being. It is stated that "Not an officer or soldier of the Continental troops engaged at Bunker Hill was in uniform, but were in the plain and ordinary dress of citizens."

On this subject of uniforms, a curious fact was related by Charles Francis Adams before the Massachusetts Historical Society. Washington, when a delegate to the Second Continental Congress, which organized at Philadelphia, May 10, 1775, attended the meetings, dressed in military uniform, and gave useful military advice. This Congress was discussing the official accounts of the affairs at Lexington and Concord. Washington was not at the time acting in any military capacity, and the same procedure to-day—attending the sessions of a deliberative body, dressed in uniform—would probably be regarded as startling. The incident strikes the student with great force as developing the state of feeling of Washington at this period. It would appear to have been Washington's way of announcing that his mind was made up, and that he was ready to take his place in the ranks in any capacity to which his coun-

**UNIFORMS—Continued**

try should call him. A few days later he was elected Commander in Chief of the American Army and arrived at Cambridge, July 2, 1775.

One of Washington's first orders was to provide distinctive marks for the officers and soldiers of the army. Ribbons of different color across the chest, and cockades of the corresponding color distinguished the grades of officers. Sergeants wore an epaulette or a strip of red cloth on the right shoulder, Corporals the same on the left shoulder.

"Brown" was ordered in 1775 as the regulation color and for a time was the uniform. Distinctions of regiments were made in the facings as was done by the British. The first instance of Revolutionary troops being clothed in blue and buff occurs in 1775 when the New York Artillery Company, Continental Army was ordered by the N. Y. Committee of Safety, to be so uniformed. In 1775 and 1776 regiments of the New York Line were clothed in blue, brown or grey broad cloth, there having been too great a scarcity of the proper cloth to carry out the original order.

In 1776 Washington—"being sensible of the difficulty and expense of providing clothes, and being unwilling to recommend, much more to order any kind of uniform"—encourages the use of hunting shirts and breeches, made garter fashion about the legs, saying among other reasons that "it is a dress justly supposed to carry no small terror to the enemy, who think every such person a complete marksman."

This may be set down as the date of introduction of the modern trouser or pantaloon. The British soon adopted it for their American campaigning. The British also imitated us in the two rank formation, instead of three—a tactical arrangement which subsequently became general.

It is interesting to note the trial of a lieutenant "for assuming the rank of a Captain—wearing a 'yellow' cockade, and mounting guard in that capacity."

In December, 1776, "charitably" disposed citizens of Philadelphia were appealed to, to furnish their "old and cast-off" clothing for the American Army. This clothing was duly distributed by General Washington before the battle of Trenton.

In 1777 at Stillwater and Saratoga, nearly if not all the militia fought in their ordinary farmers' dress.

Inspector General Baron von Steuben, reporting on the uniform of the American Army in 1777-78 at Valley Forge, writes that "The description of the dress is most easily given—the men were literally naked. I saw officers at a grand parade at Valley Forge, mounting guard in a sort of dressing gown, made of an old blanket or woollen bed cover."

In 1780 Steuben recommended for the infantry, linen hunting shirts and overalls, with small round hats cocked up on one side and good shoes. Our troops were often partly equipped with red coats captured from British, but regularly worn on duty.

A uniform order, published in 1779 by Washington, upon direction of Congress, made "dark blue" for the first time the "national color." Uniform by branches was not ordered, but by groups of states. New England was in blue faced with white; New York and New Jersey in blue faced with buff; Pennsylvania, Delaware, Maryland and Virginia in blue faced with red and so on. The Artillery however, was ordered equipped in blue faced with scarlet.

In 1780 Washington ordered two stars on a Major General's epaulette and one on a Brigadier General's. Both were to wear blue coats, with white or buff waistcoat and breeches. Regimental Field Officers wore two epaulettes; captains one on the right shoulder, lieutenants one on the left. The Corps of Engineers, also that of Sappers and Miners was to wear a blue coat with buff facings, red lining, buff waistcoat and breeches with the epaulettes of their respective grades. It was recommended to officers, "as far as practicable" to provide themselves with the prescribed uniforms.

Soon after, General Washington forbade officers to make any alterations in the prescribed uniform.

In 1783, due to inability to find scarlet cloth for facing, the Secretary of War ordered that until further orders all light infantry companies were to be clothed in blue coats faced with white. No further orders came and thus the uniform became fixed. Two authentic portraits of Lafayette show him in the uniform of the Light Infantry of the Army, which he commanded. The coat is buttoned back to show the facings. Waistcoat, cravat and breeches are white.

A service stripe for rewarding faithful enlistment was ordered by Washington in 1782.

The blue and buff uniform, as will have been noticed, was not actually worn by many soldiers. General officers, a few bodies of state troops, and Washington's body guard composed of selected men from the Infantry, were the only ones who wore it after 1779.

The Artillery uniform was as before: dark blue faced with scarlet, scarlet linings, yellow buttons, yellow binding for black felt cocked hat, yellow edging for button holes, white waistcoat and breeches, epaulettes for officers, yellow worsted shoulder knots for n. c. o's., buff belts, white cravats and black plume with red top.

In 1782-3 the American infantry was equal to the best troops of the time. This from testimony of competent judges. Even the French were struck with admiration at the maneuvers executed in their presence. At Stony Point and Yorktown the infantry had acquitted itself with particular credit.

The Corps of Artillery during the Revolution became speedily distinguished. At Monmouth, the British were forced to admit that no artillery could be better served. The French learned many lessons of skill and precision from the American artillerists. The regular cavalry distinguished themselves in

many affairs, particularly Cowpens and Eutaw Springs. The Cavalry of that day wore brass helmets and carried "long horseman's swords, steel mounted." Officers of artillery and infantry carried short sabers, 2 feet 6 inches long for company officers, 3 feet long for field officers.

In 1787 the shoulder strap, almost identical with that of to-day made its appearance.

Bands were generally in scarlet coats and blue pantaloons. For a long time bandmen were paid by contributions from the officers and men. It is interesting to note that the one statutory band now left to the army is that of the Military Academy, and it is but little larger than the band of the First Artillery and Engineers at the same post in 1795. In 1799 the white plume was again prescribed for the Infantry and with some changes is the one worn to-day.

For a while the Cavalry wore green coats with white facings, the Infantry and Artillery had blue coats with red facings.

Buttons with distinctive markings came into more general use about this time. At the present day the Infantry have the white edging, stripes, facing and plume of the Revolution and the Artillery the red plume, red facings and yellow buttons of the same period. Of the "blue and buff," general officers alone retain buff sashes and buff colored belts, to partly denote their rank.

A description of the uniforms of the American Army after 1825 is easily accessible. For an earlier period the records of the War Department, by reason of a fire in 1800 and the burning of Washington by the British in 1814, contain but very meagre information.

#### —Footwear

See also

SHOES AND BOOTS

#### —Headwear

See also

HELMETS

#### —Winter

[English Sidelights on the War. From English newspapers. *N. Y. Evening Post*, Dec 30, '15. 200 words.]

An English officer says that the cold of the Flemish nights penetrates any covering except the "smell-coats," but these sheepskin coats keep out the cold wind as nothing else will.

### UNITED STATES

#### —Aeronautics

See

AERONAUTICS—UNITED STATES

#### —Army

[Report of the Adjutant-General. *Army & Navy Jour.*, Dec 18, '15. 1000 words.]

The actual strength of the United States Army was 105,993, distributed as follows: United States, 68,258; Philippine Islands, 12,909; Hawaii, 9251; Canal Zone, 6343; China, 1406; Alaska, 770; and Porto Rico, 707.

There were 31,938 enlistments, 16,874 reenlistments, and 130,206 rejections. Discharges were 2720 by expiration of service, 9451 for

disability, and 9451 desertions. Percentage of desertions, 3.23, as against 3.10 last year.

[The Military Laws of the United States. By Major A. Ewing, Chilean Army. *Mem. del Ejército* (Chile), June, '16. 1600 words.]

(An article describing the method pursued in the preparation and drafting of bills affecting military legislation, reports submitted, and hearings before the military committees of Congress, before said proposed legislation is enacted into law.)

See also

RATIONS—UNITED STATES

UNITED STATES—MILITARY POLICY OF

#### —Army—Aeronautics

See

AERONAUTICS — ORGANIZATION — UNITED STATES

#### —Army—Artillery

See

COAST ARTILLERY — MATERIEL — UNITED STATES

FIELD ARTILLERY—HEAVY—UNITED STATES

FIELD ARTILLERY—INSTRUCTION AND TRAINING—UNITED STATES

FIELD ARTILLERY — MATERIEL — UNITED STATES

MACHINE GUN—MATERIEL—UNITED STATES

#### —Army—Cavalry

[Extracts from a Regimental Scrap Book. By S. H. Middagh. *Jour. U. S. Cavalry Assn.*, Jan, '16, continued from Oct, '15, number. 5500 words.]

(A detailed account of the work of the Fifth Cavalry in Porto Rico in 1899 and 1900, with especial reference to the relief work following the great hurricane of Aug 7-8, 1899.)

See also

CAVALRY — DRILL REGULATIONS — UNITED STATES

CAVALRY—UNITED STATES

#### —Army—Foreign Service

See also

PANAMA CANAL ZONE—MILITARY SERVICE AT THE

#### —Army—Legal Powers of

[Texas Guardsmen to be Court-martialed. *Army & Navy Jour.*, May 27, '16. 400 words.]

On May 25 the Secretary of War announced that a court martial would be assembled by order of the President to try the 166 members of the Texas National Guard who refused to respond to the orders of the President to enroll at the muster for service in the army of the United States.

Under the Dick law, it is an offense for National Guardsmen to fail to present themselves for muster. Under the new law, the call of the President will, in itself, muster the National Guard into the Federal service.

#### —Army—Machine Guns

See

MACHINE GUNS—UNITED STATES

#### —Army—Motor Transport

See

MOTOR TRANSPORT—UNITED STATES

## UNITED STATES—Continued

## —Army—Officers

[A Source of Supply for Officers. *Army & Navy Jour.*, Feb 26, '16. 600 words.]

Dr. James, president of the University of Illinois, appeared before the House Military Committee. There are 2069 cadets under training at the university, and there is an armory, a riding school, and altogether a \$500,000 plant. More regular army officers—one to every 400 cadets—should be detailed. With some changes, the university could turn out 50 men each year ready to serve as probational second lieutenants for a year. There are fifty other land-grant colleges, all susceptible of improvement in the same way.

See also

## UNITED STATES—ARMY—RESERVE

## —Army—Organization

[Military Legislation. Editorial. *Infantry Journal*, Jan, '16. 800 words.]

A bill which meets with general approval is the one based on the principle that the peace composition of an army shall be based upon its war organization. This principle is vital. An army is composed of infantry divisions, field army troops, and cavalry divisions or brigades, not of regiments or battalions. Efficiency requires that the military machine be complete in all its parts. This applies to training as well as to active service. Disproportionate and distorted results are bound to follow if we lose sight of the basic and logical principle.

[A Properly Proportioned Army. Reprinted from *Infantry Journal*, July-Aug, '09. *Infantry Journal*, Jan, '16. 4700 words.]

During almost her entire national life, the United States has attempted to measure her military strength in peace by men and regiments. A nation's military strength is her capacity to maintain her rights, if necessary, by force of arms, by armies. While men and regiments go into the making of an army, an army is not simply an aggregation of troops. It is a unity, organized according to principles based upon the world's experience. Our Field Service Regulations have decided that the division shall be the unit of measure for our army. Under existing law, we leave the practical application until war is upon us. We can never be assured of an army until this unit has been adopted and applied in time of peace. This is our immediate military necessity.

Training cannot be efficient or systematic in the absence of a definite unit of organization. We train company officers in their routine duties, but wait for war to train our generals. The terrible cost in blood, in money and in memories that can be laid at the door of our pernicious system and politics is appalling. Our Civil War taught no lessons: we managed the Spanish-American war equally badly. True, there was no occasion for generalship in its real sense in 1898, but had there been, what failures could have been ascribed to lack of training. A division

trains its commander exactly as a company officer gets his finest training for his duties in the actual handling of his company. Staff orders, and maneuvers are but preliminaries to training in leadership; and no real training can be done if there are no tactical commands for general officers.

There are other sides to be considered. Commands built along incorrect lines end almost invariably by destroying the sense of proportion of every officer, resulting inevitably that appreciation of the proper interdependence, the correct employment and the proper field of the different arms, are almost wholly lost. A proper tactical command is a much needed object lesson to every regular, national guardsman, and civilian alike. Decentralization must come with the division unit, if the division is to secure its maximum efficiency. Our faulty system has forced centralization upon the war department, and under this faulty system, questions of economy have perpetuated this restriction upon initiative of general officers. Initiative is a prime requisite for success in troop leading. Since it is universally admitted that centralization is impossible of maintenance in time of war, the time would seem to be ripe to eradicate it and the division properly organized is the solution. Such procedure would add to the efficiency of the whole administration by lightening the burdens of the War Department. As to the economy, an inefficient army is dear at any price; an efficient one may be cheap at any price. A wiser economy would have spent more in preparation and saved more in execution. A small part of the \$130,000,000 spent annually in pensions would have saved many tears and much desolation if spent in wise preparation. In any aggregation, each part struggles for itself, without any thought of the effect upon the whole. This independent struggle leads to bitterness and jealousies between the arms and the departments, and has had always a most unfortunate effect upon the army as a whole. A properly proportioned army, by very force of circumstances, will instruct every individual with respect to the proper relations of the different arms. Even this may fall short but at least it gives a reasonable hope of attaining a sense of correct proportion.

Our army must grow as the nation grows, exactly as the police force of a village increases with increase of population. Let us build by adding units, which will be a healthy growth, which our increases by mere numbers of men have never been. Readiness for war is the price of peace. Readiness comes from unity of design, unity of method, unity of results desired. Our ideal unit must be the division—worth working for, worth waiting for; its sufficiency will be the recompense.

[Emergency Increase of the Army. *Army & Navy Jour.*, Mar 18, '16. 700 words.]

By a House vote of 236 to 1 on Mar 14 and a unanimous vote in the Senate on Mar 15 the authorized strength of the enlisted men in the United States Army was increased by



nearly 20,000 men. This increase will allow the organizations of Infantry, Cavalry, and Field Artillery to be raised to full strength.

[A Military System for the United States. By Capt. Samuel R. Wharton, I.N.G., retired. *Jour. Mil. Serv. Inst.*, July-Aug, '16 6500 words.]

The ideals of the highly scientific soldier are bound to be shattered when applied to the average American citizen. It is thus useless to present an ideal military policy, as it is sure to be rejected.

Every country has "citizen soldiers." In the European monarchies they have passed thru the regular army and are thoroly trained. Citizens of the United States called from civil pursuits for annual encampments or army maneuvers for such periods as hazard their employment had better by far join the regular army in the first place. Any plan which materially interferes with regular employment is doomed to failure. Hence the military training of the civilian must be on week ends or vacation days; in other words, during his spare hours. No army reserve, volunteer force, or other organization outside of the regular army can be trained in violation of this principle. There must be a flexibility of military work that will encourage instead of discourage the civilian.

The United States regular is the ideal soldier of modern times. Personal attachment to the service and mutual affection between officers and men, as well as the performance of every kind of duty with the greatest efficiency are all testimony of the highest value to prove this assertion. The American soldier is either completely a soldier or he wants to be entirely free from the army. He wants no half-measures. If he desires to quit the service at the end of his enlistment he wants no strings to his freedom.

Were it not for the vicious system of voluntary enlistments the militia under the instruction of late years would have been efficient. For ten years after the Spanish-American war the officers of militia, having in mind the lessons of that conflict, were hard-working and intelligent in the performance of their duties. In more recent years the efforts made to keep the National Guard organizations in reasonable shape have been heroic.

Whatever of correction possible in our interference with the army and navy thru politics must come from the people. They must be educated. By law every child must attend school. Why have we not the same right to require that military education shall be compulsory?

In the organization of a reserve, it has been proposed to pay \$100 a year to each man. A private soldier in the regular service gets only \$180 a year for full time, and is it just to him that the reservist shall get \$100 for only a small service? Besides, is it just to the reservist to pay him only \$100 and require him to jeopardize his employment by absenting himself to attend the prescribed periods of military training?

The sources of supply for enlistments are three: from those filled with military enthusiasm; from those whose mothers "did not raise their boys to be soldiers"; and from a great intermediate and indifferent class, who will freely devote their leisure time to military training if it is fashion.

The Constitution says that Congress shall have power to raise and support armies. This means to assemble troops, equip them and train them. If the turning of the militia over to the national government requires an amendment to the Constitution, then, by all means, it should be amended. Where there is a will there is a way, and the will of the people is above all quibbles of statutory law. We must have a real National Guard, under the direction and control of officers of the regular army.

(Tables showing male population at various ages are shown; and the details of a proposed system are discussed.)

[The Army Under Reorganization. *Army & Navy Jour.*, June 17, '16. 100 words. 3 tables.]

The present organization has a total strength of 5029 officers, a minimum of 81,932 and a maximum of 128,653 enlisted men. When the reorganization under new legislation shall have been carried out the army will consist of 65 regiments of infantry, 25 regiments of cavalry, 21 regiments of field artillery, 7 regiments of engineers, 2 battalions of mounted engineers, 263 companies of Coast Artillery a total of 6954 officers and 163,161 (minimum) or 226,649 (maximum) enlisted men in the combatant arms. Additions for the Signal Corps, Medical Department, Quartermaster Corps, other troops and staff departments brings the authorized strength to 11,327 (or 11,942) officers and 208,338 (minimum) or 287,846 (maximum) enlisted men.

The new law gives a strength of 51 officers and 1321 (peace) or 1942 (war) enlisted men for an infantry regiment. A cavalry regiment has 52 officers and 974 (peace) or 1450 (war) enlisted men. A field artillery regiment (three-battalion) has 41 (peace) or 44 (war) officers and (about) 850 (peace) or (about) 1250 (war) enlisted men. An engineer regiment comprises 33 officers and 671 (peace) or 1011 (war) enlisted men. The mounted engineer battalion comprises 16 officers and 229 (peace) or 346 (war) enlisted men.

[A Modern Organization for the Regular Army and Its Use as a Model in Organizing Other Forces. Prepared by the War College Division, General Staff Corps. *Jour. Mil. Service Inst.*, May-June, '16. 4000 words.]

(A description of the organizations of the United States army, pointing out the defects and pointing the way to improvements. The passage of new legislation obviates many of the difficulties mentioned.—Ed.)

[United States. The North American Army. *Revista Militar* (Portugal), May, '16. 450 words.]

**UNITED STATES—Continued**

(An account of the organization of the United States Army before the enactment of recent legislation, giving the numbers and pay of the officers and enlisted men.)

[The Organization of the United States Army. By Martin Wells. *Scientific American*, Aug 5, '16. 2500 words. Illustrated.]

(A popular article giving the strength, composition, and organization of the United States army. Each branch of the service is described briefly. The organization of higher units for field service is given.)

**—Army—Promotion of Officers**

[Equalization of Army Promotion. *Army and Navy Register*, Dec 11, '15. 300 words.]

There has been much talk of late regarding the equalization of army promotion, and there are those who, anticipating increases in the commissioned personnel, express a desire for the adoption of promotion from a single list.

There is, however, nothing of the sort in Mr. Hay's army bill. The measure contains no provision for altering the present method of promotion.

There is a provision, however, "for the purpose of lessening as much as possible inequalities of promotion, due to the increase in the number of officers of field artillery," for filling vacancies in the grades of first and second lieutenant in that arm "by promotion or transfer without promotion of officers of other branches of the line of the army."

**—Army—Recruiting**

[Note. *Army & Navy Jour.*, Apr 29, '16. 100 words.]

Since Congress authorized, on Mar 5, an addition of 20,000 men to the regular army, 4699 have enlisted, making a net gain of something over 2000. The average net loss to the army from all causes is about 2000 per month. Last year 42,000 men left the service and 17,000 re-enlisted. Present recruiting is at the rate of about 4000 per month.

[Future Recruitment. By Capt. Frank Geere, C.A.C. *Jour. Mil. Service Inst.*, May-June, '16. 6000 words. One illustration, one table.]

Recruiting is an important part of the problem of an increase in our army. Many believe that all is done now that can be accomplished by voluntary enlistment. Others believe that new factors have entered or may be introduced that will increase enlistments. The recruiting problem differs for the regular army and the militia organizations. One is a matter of employment, but the citizen soldier is governed by different motives, chiefly by patriotic spirit.

Since the new pay schedule of 1908, the regular service has been kept fairly well recruited. The actual shortage was 8936 on June 30, 1914, and 1483 on June 30, 1915. Enlistments and re-enlistments for 1914 were 41,871; for 1915, 47,388. As these two years were notably bad for employment, 1915 repre-

sents approximately the maximum voluntary enlistments under existing statutory methods.

An authorized strength of 97,200 about 39,416 annual enlistments up to strength of which 7000 are made up casualties by desertion, discharge.

Militia statistics for the calendar year 1914: infantry organizations were 21,571; minimum strength, 93 cavalry troops of 969 men, and 68 batteries were shown the prescribed minimum. It appeared that recruitment of the state militias has reached its limit.

There is one regular to every 1000 civilian, one militiaman to every 800, and a military force of one man for every 100 inhabitants. It was estimated in 1914 there were 17,049,069 males of military age in the United States. Our military force was one and one-third per cent. of the population.

There is only one country—Great Britain—with which a comparison may be drawn. A comparison shows that Great Britain (exclusive of overseas colonies) had in 1914 a total military force of 655,000 men in a population of 45,000,000 as against our 17,000 in a population of 100,000,000. The British soldier is no better compensated than our own and employment conditions in 1914 were about as bad in the United States as in Britain. Great Britain had 315,000 soldiers. Canada, with a population of 10,000,000, had a militia of 64,000 men. Similar percentages in our population would produce National Guard forces numbering 700,000 and 800,000 men respectively. Captain H. H. Scott suggests the idea that payment of the militia change matters materially.

If we could recruit for the regular army as was possible in Great Britain, we could maintain a regular army of 556,000, with an annual enlistment of about 185,000. This means that the British men enlist in six times the number that our men do. Some influences therefore operate to prevent enlistment in our regular army. These are summarized as follows:

1. Dislike for the military.
2. Belief that an army is undemocratic.
3. Misconception of the military service.
4. Mistaken notion of moral influence of the army.
5. Inherent distaste for disciplinary conditions.

Such antagonism does unquestionably exist, but the hour may have arrived to conquer it. The majority of men in the Middle West who contemplate military service are dissuaded by friends. Postmasters are unwilling to assist in reaching eligible recruits. Some who came to the recruiting offices back to talk it over with friends and then came back. There may possibly be a feeling that service will operate against prospective civil pursuits, and there is an idea that the army is bereft of all moral influence. These ideas must be eradicated and some enthused

for the army built up if a large army is to be maintained.

Our recruiting literature is open to criticism as supporting by its promises the suspicion that something disagreeable is concealed. Somehow it seems to stand out that the job wants the man more than the man wants the job.

The conditions in the British service are much better. No such clamorous appeal for recruits is made. High among their recruiting literature is a little book which on its opening page states that "the profession of a soldier must be considered today as standing high in the roll of trades," and setting forth the advantages of military service in a dignified way; among others that certain occupations are, in whole or in part, reserved for ex-soldiers.

This method of blending the moral and material benefits is in striking contrast with our appeal to the purely material features.

Utilization of postmasters in recruiting offers one of the best methods of reaching the desired end. 55,000 recruiting agents are thus available.

One feature of the war posters of Great Britain (of which there were over 100 designs) that appealed particularly to the writer was that they appealed as much to the public at large as to the eligible recruit. Success in recruiting must result from an appeal to the people, and the widespread desire for adequate defense offers an opportunity to move for the friendly aid of the people in recruiting.

#### —Army—Reserve

[The National Defense—A Solution. By Major John H. Parker, 8th Infantry. *Jour. Mil. Service Inst.*, Nov-Dec, '15. 5500 words.]

Under the present system of recruiting, more than half the enlisted men of the Regular Army are little better than recruits. The units, now at peace strength, would, for war, be doubled in size, with a corresponding decrease in efficiency. After eliminating the unfit from the National Guard, the scant remainder, inadequately trained, would be swallowed up in a huge increment of green recruits. The forces required for a national crisis, such as confronted Belgium, would be so large that the groups mentioned above, as now constituted, would be negligible.

The solution offered would provide a trained force of volunteers, stiffened by the best regulars and officered by experts in all directive grades. Each regiment, on some convenient date, would reduce its companies to cadres of officers and 25 picked men each. To each company would be assigned 125 recruits, and a course of training adopted that would cover 10 months. As the start would be made with a homogeneous class under competent instructors, the program could be so arranged as better to utilize time than with the present mixed organizations. At the end of 10 months these recruits would be furloughed and the officers and men of the "training school regiment" sent out to canvass for another class. The furloughed men would be called in for

two weeks of annual training during the remainder of their four-year enlistments.

After 3 years and 2 months each regiment would have, actually under arms, or on furlough, 6000 enlisted men. The clothing, arms and equipment of each man on furlough would be kept in his locker at the regimental station. By calling in the men on furlough the regiment could be expanded into a brigade, with the colonel as brigade commander, etc. The additional officers needed could be secured among the graduates of military schools, to whom commissions as "officers of Minute Men" had been previously issued. These officers would receive the necessary training during the annual encampments of two weeks. The enlisted men would be paid \$100.00 a year during the time they were on furlough—a sufficient inducement to secure the necessary number of men.

This plan would provide a trained force of 350,000 men at an annual expense of \$35,000,000, about the amount of the annual decrease in the Civil War pension roll.

[Continental Army and National Guard. By Major Benson Wright, Officers' Reserve Corps, N. G. of Washington. *Army and Navy Jour.*, Jan 15, '16. 1000 words.]

About the maximum time devoted to military training in a year by a guardsman is 230 hours. The continental in 60 days, reckoned at 8 hours per day, will get 480 hours. In cost, the continental will save expensive armories, [but use up tents—Ed.], though the figures are not conclusive. The continental need have but a single service uniform. The main point is that both the guards and the continentals have their good points, and they appeal to two different classes of men. The National Guard will draw the city man who can give an hour a week, and the club or athletic features of guard service may be a consideration. To many other classes, sixty days may be available and the continentals may appeal to them.

[Reserve Officers and Non-commissioned Officers. By Capt. Edward K. Massee, 11th Inf. *Infantry Jour.*, Jan, '16. 1300 words.]

A reserve of trained men who could be utilized in time of war can be established by forming battalions or regiments of cadets at selected colleges and universities, officers to be detailed from the regular service. Enlistments should be for eight years, courses both practical and theoretical to be prescribed in War Department regulations. Each cadet in return to receive his education, board, clothing, etc., and to be quartered in barracks near the university. Cadets completing various stages of the course with success to be enrolled, after examination, in the reserve. If called into the field during cadet service, they should be paid as in the regular service.

It is believed that careful consideration will show the value of this scheme. The benefits to the country at large are incalculable, and the plan will show results far beyond the financial investment.

**UNITED STATES—Continued**

[A Proposed Plan to Secure a Reserve of Officers of Our Volunteer Armies. By Capt. Allen J. Greer, 1th Inf. *Army & Navy News*, June, '16. 1800 words.]

The spirit of an army depends upon its officers. Masses of men merely become unwieldy and inert without trained officers. No nation can, however, train or maintain all the officers necessary to provide for war needs. Even Germany could not and did not do so.

With us the problem of trained officers would be acute, and a large number would be necessary on account of the fact that our armies must be fashioned from raw material.

It has been suggested that the Military Academy at West Point be largely increased. This should be done, but even so it only prepares young men in mind and body to be fully qualified by subsequent service. West Point should remain a source of supply of officers for the regular establishment.

Cadet companies have been suggested but the training would be largely theoretical. A better plan is believed to be to increase each troop, battery, and company to war strength and then appoint two provisional lieutenants so that each of the four platoons would be commanded by a lieutenant. Such a plan would call for 1492 provisional lieutenants each year to be given thorough theoretical and practical instruction. In six years, allowing for casualties, there would result a reserve of about 7000 officers. The cost of such a scheme would be about \$2,000,000 a year. Experience of military training camps indicates that the necessary personnel would be forthcoming.

[The Army Reserve Corps. Editorial. *Army & Navy Jour.*, Oct 21, '16. 700 words.]

There are 700 candidates for commissions in the Reserve Corps of the line, and 300 applications for commissions in the Reserve Corps of the Q. M. Corps. It is believed that 1000 officers of the Reserve Corps can be secured within a year. Due to conditions on the Mexican border, enlisted men are not for the present being furloughed to the reserve after one year's service.

See also

ENGINEERS—ORGANIZATION  
NATIONAL GUARD (UNITED STATES)  
UNITED STATES—ARMY—OFFICERS  
UNITED STATES—MILITARY POLICY OF

**—Army—Reserve—Engineers**

[Note. *Army & Navy Jour.*, Mar 25, '16. 300 words.]

A bill has been introduced into Congress providing for a reserve for the Engineer Corps of the army. Commissions will be granted by examination to include the grade of major, and good for five years. Two weeks' training each year is provided for. Although this time is short, the civil duties of engineers are similar to those required of them in war. The knowledge of manufacturing and contracting establishments pos-

sessed by the civilian engineers will be a valuable asset.

**—Army—Sanitary Service**

[Preparedness of the Medical Department. By Alton G. Grinnell. *The American Review of Reviews*, Mar, '16. 3000 words. Illust.]

The medical department of an army has two functions—prevention and cure. The medical scientist of the present day wages perpetual warfare against the invisible hosts of bacteria, and thanks to the devotion of numerous investigators, some of whom have paid with their lives for their daring, the habits and descriptions of many of these parasites have been catalogued and means discovered to combat their pernicious activities.

To the credit of the American Medical Department stands one of the most striking examples in the history of preventive medicine—that of the extirpation of yellow fever. The Japanese army came out of the Manchurian war with the lowest percentage of deaths from disease theretofore recorded in a great war, due to their preparation against bacilli; and according to reliable reports, the Germans have placed the notoriously unsanitary Turkish army on an equal health basis with other modern armies.

Yellow fever, pernicious malaria, the plague, cholera, dysentery and smallpox can now be controlled; and typhoid fever can be eradicated.

In time of war the forces of the United States would be made up in large proportion of men unaccustomed to exposure in the field and the necessary hardships of campaign. This will increase the problems of the medical officers enormously. The first preventive provision undoubtedly will be to immunize the men from typhoid. The importance of this cannot be overestimated, when we consider that, of about 350,000 cases each year in the United States, one-tenth are fatal, and thousands of those who apparently recover are left permanently injured; and compare this with the fact that the disease can be entirely prevented.

A trained soldier can make a day's march on a canteen of water, while the "discipline" of the average volunteer is severely tested when he is required to pass by a roadside pump. Any water that is cool, regardless of the quantity of bacteria it contains, looks good to a recruit; and numerous diseases find an entrance through the "water route." An apparatus devised by Major Wm. L. Lyster, U. S. Medical Corps, bids fair to solve the problem of furnishing pure water in any quantity and at any time. It consists of a canvas water bag of simple design, about 24 inches in diameter and 28 in length, and in the use of 15½ grains of hypochlorite of calcium in each bag of water. Under ordinary circumstances the water is rendered safe for drinking in five minutes.

Thousands of physicians will offer their services on the outbreak of hostilities, and these scientists can be utilized in hospital work in the field and at bases; but for the proper conduct of operations on the battle

field and on marches the necessary number of trained military medical officers must be provided, or our experiences in the future will be similar to those in the past. There are in reserve now a sufficient supply of medical "units"—less personnel—to serve an army of 200,000 men, or about half the number recommended by the Dodge Commission, which was appointed just after the Spanish War.

The line officers are now thoroughly cognizant of the value of sanitation in the field, and their co-operation will go a long way towards solving the difficult problems of the surgeon.

[Sanitary Service in the United States. By Colonel Urcullu, Spanish Military Attaché at Washington. *La Guerra y su Preparacion*, Aug. 16. 2500 words.]

(An account of the organization of the medical service of the United States Army.)

See also

SANITARY SERVICE—UNITED STATES

—Army—Signal Corps

See also

AERONAUTICS—UNITED STATES

WIRELESS TELEGRAPHY—APPARATUS AND EQUIPMENT—PORTABLE—UNITED STATES

—Army—Staff

[Can the General Staff Corps Fulfill Its Mission? (Silver Medal Prize Essay.) By Maj.-Gen. W. H. Carter, U. S. Army. *Jour. Mil. Service Institution*, May-June, '16. 6000 words.]

The General Staff Corps was created by act of Congress, approved Feb 14, 1903. By its creation it was hoped to eliminate the friction in the War Department, due to the double function of the Adjutant-General, who was practically Chief of Staff to the Secretary of War and Adjutant-General to the Commanding General of the Army. This double function gave to his office a preponderating influence in the administration of the army, yet resulted in inefficiency and discord. There could properly be but one authority between the Secretary of War and the whole army, including bureaus and departments.

The duties of the General Staff Corps were defined by law, and included the preparation of plans for mobilization and defense, and other proper and usual duties of a General Staff. Certain of these duties, notably that of military information, had already been performed by the Adjutant-General's office. But many General Staff duties involve the various supply departments and require a co-ordinating head acting in the name and by authority of the Secretary of War. So the law was drawn to make the head of the General Staff Corps chief of staff of the army, thus overloading him with duties but safeguarding against former difficulties with reference to the control of staff bureaus, and definitely discontinuing the system of doing business between departments by courtesy in matters of national defense.

The chief of staff is detailed for a period of four years, and is automatically relieved when a President goes out of office.

Chaos has always reigned in war. A committee of investigation sat almost continuously in the Civil War, and again after the war with Spain.

Congress cannot legislate wisely except on some deliberately prepared plan, and one of the functions of a General Staff is to have such plans in readiness in peace and war.

In order that the General Staff officers should not degenerate into bureau officers, continual change in the personnel was provided for, as well as a rotation of duties. Such a system would ultimately provide an array of officers presumably fit for command.

The opinion has prevailed that influence was as potent as talent in selection, and it is important that the army shall be satisfied that such is not the case. Officers are selected by sworn boards. The original board comprised six generals, of whom two only were West Point graduates, yet the original details to the General Staff were all graduates and of all branches except medical and pay departments.

Various difficulties now arose. Junior officers detailed from staff bureaus were supposed to represent those bureaus. Gradually it was recognized that matters affecting bureaus should be referred to the chiefs of the bureaus and finally decided by the chief of staff by authority of the Secretary of War. Schemes for distributing details to various arms and to various classes were proposed and even acted upon. Merit alone should determine the detail.

To meet a criticism, the Secretary of War prohibited the selection of aides-de-camp for detail to the General Staff. Later, this prohibition was removed, and the ultimate result was a reduction in the strength of the General Staff Corps.

The history of the corps will show whether it has fulfilled its mission in the past and will probably do so in the future. The Inspector-General's Department was able to block the plans in regard to it. The next great problem was to use the Adjutant-General's Department as a bureau of records and at the same time reduce it to a status subordinate to the Chief of Staff. This was liable to be difficult on account of the power and prestige gained by the Adjutant-General through a century of aggrandizement. The result was the creation of the military secretary's office. In 1907 this designation was abolished and the Adjutant-General resumed his title, by authority of Congress, with rank superior to that of the then chief of staff. Such a situation must ultimately—and it did—result in a contest for supremacy between the chief of staff and the adjutant-general, with the result that the adjutant-general retired. While the successful rival remained in office, with greater power than any commanding general ever had, the antagonism to the General Staff Corps grew and resulted in a reduction in its number.

However, during this struggle for power, there has been a serious study of general staff problems. It required some years to secure proper employment of General Staff officers with troops. The difficulties will gradually disappear, and where all the generals are

**UNITED STATES—Continued**

graduates of the service schools and the War College, things will run smoothly. A list of highly qualified officers will result, and they will undoubtedly be selected for command. Courage, forcefulness, and ability to command men are sufficient to achieve prominence in war, but the organization of armies, the planning of campaigns, and the handling of the greater strategical combinations in wars of magnitude demand careful and progressive training and prolonged study and analysis of history.

The General Staff Corps assures a continuity of policy and of effort. All the past wars of the nation have been characterized by lack of preparation in every respect. This condition has been helped by the creation of a General Staff Corps.

The duties of the military profession are becoming more complex. The General Staff system may not eliminate all sins of omission in preparedness. By co-ordinating the work of all branches of the service, and not trying to absorb their special functions, the General Staff Corps may fulfill its mission and achieve the great national purpose for which it was created.

**—Army—Supply and Transport**

*See also*

**MOTOR TRANSPORT—UNITED STATES**

**SUPPLY AND TRANSPORT—UNITED STATES**

**—Army—Uniforms**

*See*

**UNIFORMS—UNITED STATES**

**—Coast Defense**

[Report on Coast Artillery. By Chief of Artillery. *Army & Navy Jour.*, Dec 18, '15. 2000 words. Tables.]

The present authorized strength of the Coast Artillery Corps (701 officers and 19,019 men) is short by 530 officers and 10,828 men of the number required for the seacoast batteries to be manned by regular troops. Batteries costing approximately \$41,000,000 have no manning bodies provided.

From the experience in the European war, "the ability of coast fortifications to protect coast cities and anchorages from bombardment, and to prevent an enemy's naval forces from running past fortifications in restricted waters, cannot be doubted." So far as matériel is concerned, "the United States possesses to-day the most formidable system of coast defenses in the world," but the force to man this system is inadequate, and without trained troops to man them, seacoast fortifications are not only useless, but might even be made use of by an enemy.

Heavier naval ordnance calls for increased calibers in seacoast guns, to gain the advantages of "greater striking energy, greater accuracy of fire, greater perforation of armor," and increased explosive charge.

Greater attention should be given to the utilization of the landward fire of guns and mortars to aid in the defense against land attack, as this fire control could be made effective by aerial observers.

Ammunition, aircraft, submarine mines, fire-

control apparatus, and reserve instruments and boats are needed.

[Defensive Needs of the Pacific Coast. Statement of Maj. Gen. Arthur Murray, retired, before Senate Military Committee. *Army & Navy News*, Mar, '16. 2800 words]

In connection with the defense of the Pacific Coast, there should be not less than four nor more than eight dreadnoughts or battle cruisers of the swiftest and most powerful type, based on Pearl Harbor, to prevent the convoy of troops by an enemy navy. There should also be twelve submarines for harbor defense of the Pacific Coast ports.

A total of 13,000 coast artillery is needed to man the seacoast defenses existing and some necessary additions of long range mortars.

Considering only landing parties of sailors and marines, estimated at 12,000 to 15,000 as a maximum, there should be four infantry divisions of 12,700 men each, and one cavalry division of 7980, a total of 58,800 mobile troops. There should be one infantry division to guard the coast from Puget Sound to the mouth of the Columbia River; one from the Columbia River to San Francisco; one from San Francisco to Los Angeles; and one from Los Angeles to San Diego. The cavalry division should be used to support the two infantry divisions south of San Francisco.

The detachment for the immediate land defense of the seacoast fortifications should be taken from the divisions assigned to the including section of the coast.

*See also*

**COAST DEFENSE**

**—Coast Defense—Aeroplane Scouts**

[Air Patrol of Our Coast. By Rear-Admiral R. E. Peary in the *New York Times*. *Army and Navy Register*, Nov 20, '15. 1800 words.]

As the initial step in carrying out the most excellent plan of establishing a system of patrolling our coast with aeroplanes, there will soon be established in Casco Bay, near Portland, Me., the first aerial coast patrol station in this country. A hangar will be set up and a hydroaeroplane installed, in charge of two trained aviators.

The idea is to divide the entire coast line, both Atlantic and Pacific, into convenient districts, in each of which a patrol station will be established by the community until a complete chain of such stations has been formed from Maine to the Rio Grande and up the Pacific coast to Puget Sound.

In order to get this system in operation without delay, it will be necessary to build the stations through private means, but when established they may be put under the control of the Naval Militia and later turned over to the government to form a part of the Coast Artillery Service.

The advantage of this system may be seen at a glance. In time of emergency, each section of the coast will be patrolled by a powerful hydroaeroplane, having an easy cruising speed of 50 miles an hour, and carrying a pilot and a trained observer. Cruising fifty miles out to sea, at an altitude of 2000 feet, the observer could detect the approach of an

enemy's ship while it was 50 miles still farther from the coast, and could report it by wireless long before it could arrive in position to attack.

The Portland Chamber of Commerce has undertaken to raise the funds for the first station of the system, and it is hoped that other communities along the coast will follow suit promptly, so that the entire chain may soon be complete.

[An Air Patrol for Our Coast. By Rear Admiral Robert E. Peary. *Flying*, Dec, '15. 1600 words, 1 map.]

The first aerial coast patrol station in the United States will soon be established in Casco Bay near Portland, Maine. This will be but the first step in an undertaking which has as its ultimate object the establishment of a chain of stations extending along our entire coast line from Eastport, Maine, around Florida to the Rio Grande and up the Pacific Coast to Puget Sound.

It is proposed to divide our entire coast line into "beats" to be patrolled in time of need by powerful hydro-aeroplanes. These machines with a cruising speed of fifty miles an hour, will fly 50 to 60 miles out to sea at an altitude of 2000 feet. They can detect the approach of an enemy's ship 50 miles further away, hours before they could possibly make an attack. By means of light wireless already perfected for a radius of more than fifty miles, complete information could be sent to the coast forts or land stations of the number and character of the ships. Such a system would render a surprise attack practically impossible.

In order to provide such a system in the immediate future, it will be necessary for each community to establish its own stations through private means. Once established, it should be possible to put the stations under the control of the state naval militia, or they might be taken over by the government and become a part of the Coast Artillery service.

The immediate result of this system will be to provide the government in case of need with a considerable number of hydro-aeroplanes, say 50, also the services of about 100 trained aviators. As time goes on there would be many more, for each patrol station would become a flying school recruiting its pupils from the National Guard or other defense organizations and volunteers.

The plan for the Casco Bay station might serve as a guide for other stations to be established subsequently. From this station as a base, it is intended to patrol the coast line from Portsmouth to the mouth of the Penobscot. This will require only an hour's flight in each direction. In time of danger four flights a day over this "beat" would insure that part of the coast against a surprise attack.

In connection with the development of this aerial coast patrol, locations have been made available in New York and Georgia for use as landing stations. These with the Maine

station cover broadly the Atlantic coast, and on account of the European war they have become of national importance.

The Casco Bay station will be established by the Portland Chamber of Commerce and the movement has already received the indorsement of President Wilson, Secretary Garrison, and Secretary Daniels.

#### —Coast Defense—Against Submarines

[Hostile Submarine Action on the American Seaboard. By Rear Admiral Degouy. *The Military Historian and Economist*, Jan, '16. 6000 words. Map.]

In case of conflict between the United States and the Central European powers, would Germany be able to establish submarine bases on the American coast? Inasmuch as an expedition for such a purpose would require a fairly large number of vessels, which would necessarily have to be screened from the English fleet in passage (assuming that a state of war still existed between England and the Central Powers), the possibility of success is remote.

In case the attempt should be made, however, several conditions must be considered.

*The type of submarine to be used.* It must possess endurance in the highest degree. An increase of tonnage,—increasing thereby reserve motor energy, and providing better living accommodations for the crew,—generally increases the self-sustaining power.

The selection of a motor and the make-up of the armament have great influence on endurance. Due to the weight of automotor torpedoes (nearly a ton each) the supply of these, at the utmost, cannot reach more than twelve. For a submarine squadron this will suffice for extended operations, but reduces the radius of action of a vessel operating alone.

Automatic mines, ingeniously disposed in wells that can be opened and closed, are becoming an important adjunct to the armament; and guns are in very general use. This variety of armament is an important factor in the continuity and length of time governing the action of an isolated submarine.

*To reach a distant field of operations.* The vessels must traverse safely a space of several thousand miles. The German U21-U32 class has an ordinary radius of 1500 miles on the surface at 12 knots, and 70 miles submerged at 6 knots. It is estimated that by taking an extra load of petrol, the surface radius can be increased to 3000 miles. The U33-U38 class, of greater displacement, is currently reported to have a surface radius of at least 4000 miles. This is precisely the distance to the coast of the United States around the north of Scotland, which must be the route under present conditions. Hence a submarine would arrive on the American coast without fuel unless other means are provided for a reserve.

*Convoy.* With a towing convoy well fitted for the task of carrying a fuel reserve, and with no interference, the trip could be made from the German coast, via a point off Bergen, Norway, thence to Iceland, from there to the southern point of Greenland, and then

## UNITED STATES—Continued

southwest, inside of Newfoundland. Under favorable conditions the voyage could be made without stop, but a supply station might easily be established at one of the island fishing ports. And it certainly will not be news to the citizens of the United States that it would be mere child's play for the German Admiralty to organize a complete system of secret supply along the North American coast. (The author explains in some detail how this supply might be arranged to cover the Atlantic Coast, the Gulf of Mexico, and the Panama Canal.—Ed.)

## —Compulsory Military Service

[Compulsory Service in the United States. By George Nestler Tricoche. *Arms and the Man*, Nov 25, '15. 5000 words.]

(This is a paper published in the *Yale Quarterly Review* for October. It treats of the benefit to be derived from compulsory service in producing a disciplined civilian population, rather than in providing a military force for defense, and is intended to show that a compulsory service which does not interfere to a serious extent with the economic life of the nation can be established much more easily than is commonly believed.)

[Conscription Must Come. *Arms and the Man*, Dec 16, '15. 400 words.]

Of the many projects for the preparation of the nation for defense which are now being discussed, some have great merit, but not one goes far enough. The half-way measures which they propose may be adequate now, but sooner or later the country will find it necessary to go the full distance toward preparedness, and adopt compulsory military training and service for all.

The prejudice held by the people of this country against compulsory military service is a more or less unreasoning one, due in a great measure to an instinctive dread of being deprived of any portion of the liberty to which their citizenship in this country entitles them. The nation was founded as a free republic, and the people, taking great pride in its being a free republic, find objectionable the thought of being compelled to a service of any kind. But if the country is to continue worthy of this pride which its people have in it, it must maintain itself in its present high place among the nations of the world, and this cannot be done without the adoption of a system of adequate military training of her citizens.

Such a system, just, reasonable, and fair to all, is compulsory service throughout the land.

[The System of Military Conscription Proposed by George Washington and General Henry Knox. By Major Henry C. Davis, U. S. M. C. *Jour. Mil. Service Inst. U. S.*, Jan-Feb, '16. 5500 words.]

This article is made up of extracts from Vol. I, American State Papers, and comments on the same.

Gen. Knox, as Secretary of War, prepared a plan for the arrangement of the militia and

submitted it to the President, who returned it approved, with certain exceptions. The plan, amended to meet the views of the President, was re-submitted Jan 18, 1790, and forwarded to Congress by the President, Jan 21, 1790.

In his letter of transmittal, Gen. Knox suggested that an efficient military branch of the government could not be invented with safety to the principles of liberty unless formed of the people themselves, and supported by their habits and manners. In an introduction, much of which was written by the President, it is stated that, while a republic is more favorable to the liberties of society than any other form of government, its peace and existence are more precarious than one in which a single will directs the whole, unless it make proper arrangements for meeting the exigencies to which all states are liable. A government whose measures are the result of multiplied deliberations can seldom adopt instant measures to meet emergencies.

The purpose of the plan was to suggest an efficient system of defense that would also produce habits and manners that would give strength and durability to the whole government. Convinced that every man should personally perform his share of military duties, and that one of these duties was preparation for national defense, the founders believed that thorough dissemination of military instruction and discipline would encourage a national spirit, inculcate desirable mental qualities, and elevate the physical standards of the people.

## The Plan

All men from the ages of 18 to 60 years, with the exceptions of actual mariners and such others as the several legislatures desired to exempt to be enrolled for different kinds of duty and divided into three classes:

1st. The advanced corps, those from 18 to 20 years of age. These to be placed in annual camps; the first two years for 30 days each and the last year for 10 days. The enlisted men to receive no pay during these periods but to be armed, clothed and subsisted at federal expense. In case of invasion or rebellion, members of this corps to be liable for service anywhere in the U. S. for one year from the date of the marching from the regimental parades, and while on such service to have the pay and allowances of federal troops. A certificate to be given at the end of three years' service, and this to be an indispensable qualification for exercising any of the rights of a free citizen, until after an age to be fixed by Congress.

2nd. The main corps, those from 21 to 45 years of age. These to preserve and circulate the military discipline acquired in the advanced corps, arm the people and fix by habit and practice the forms and maxims essential to free government.

3rd. The reserve corps, those from 46 to 60 years of age. These to be organized so as to free a greater proportion of the robust men for the more urgent duties of war.



The federal government to make adequate provision for furnishing arms, equipment, rations, clothing, etc., for the annual camps and for the payment of the militia officers and certain staff officers while on duty.

To the states was reserved the right to appoint officers and train the militia according to the discipline prescribed by Congress.

—History  
See also

CIVIL WAR (U. S.)

EUROPEAN WAR—RELATIONS WITH NEUTRALS—UNITED STATES

MEXICAN EXPEDITION (U. S.), 1916

MEXICAN WAR (WITH UNITED STATES)

VERA CRUZ—U. S. OPERATIONS AT IN 1914  
WAR OF 1812

—History—Relations With Japan  
See also

JAPAN—HISTORY—RELATIONS WITH  
UNITED STATES

—Military Conditions

[Needs of the Army. By John E. Morris. *Army & Navy Jour.*, Nov 27, '15. 1000 words.]

Criticises the inadequacy of the present and projected forces as being able to put into the field only 40 regiments of infantry, 20 regiments of cavalry—combined strength, 46,800 rifles—and 216 guns. Criticises also the method of adding recruits to reach war strength, as the marching value of the organization is then determined by the recruits. Our transports are old, inadequate to carry troops and their supplies, and slow. New and fast transports, capable of carrying entire organizations and their supplies and transportation, should be built.

[The Arms and the Man. Editorial. *Scientific American*, Apr 8, '16. 1200 words.]

An army comprises two essential elements, personnel and matériel. Each is impotent without the other. Our matériel is grossly inadequate. Our largest field gun is of 6-inch caliber, and the British call their 6-inch gun "The Baby." We have 900 guns of all calibers and 650 rounds of ammunition per gun. We can make 500 guns and 500,000 rounds of ammunition per year at our arsenals.

We have 700,000 Springfields and 400,000 old Kraggs with 300 rounds of ammunition for each. Our arsenals in three shifts can turn out 437,000 rifles per year and about 300 rounds of ammunition per rifle. We have completed and under manufacture 1077 machine guns, and we need 2225 even on estimates made before the war.

Our coast forts are armed with obsolescent guns. "The situation may be summed up in the statement that in practically every essential, we are short of proper reserves for our existing military forces, to say nothing of those we propose to create."

The necessary steps in preparation will be costly, and current revenues will not meet them. The field artillery project calls for \$280,000,000 for guns alone. A half-hour's supply of ammunition for the coast artillery costs \$7,000,000, and necessary changes in

coast artillery armament will cost \$100,000,000. Necessary preparations will cost \$1,000,000,000, but it is an issue that we cannot dodge.

—Military Policy of

[Working to the Same End. *Arms and the Man*, Nov 25, '15. 200 words.]

A reading of the resolutions of the National Guard Association, in session at San Francisco, shows clearly that the association, though opposed to Secretary Garrison's plan for the creation of a continental army, is, in most things, in accord with his program for preparedness. The association believes that preparedness can best be achieved by increasing and developing the army and National Guard, a policy to which Secretary Garrison has given his hearty approval.

Both Secretary Garrison and the association believe that maximum results cannot be obtained while the Federal government has as little authority over the citizen soldiery as at present. The Secretary's remedy is to create a body of continentals wholly under Federal control, while the association would amend the Constitution so that Federal authority over the National Guard might be enlarged.

Secretary Garrison and the National Guard Association are in reality laboring to the same end.

[Land Defenses of the U. S. By a National Guardsman. *Arms and the man*, Dec 2, '15. 1400 words.]

Now that the war in Europe has awakened the people of this country to an understanding of their great need for military preparedness, it is time for us to act quickly, before the lesson shall have been lost, in creating a definite, adequate scheme of national defense.

The institutions which at present constitute the nation's land defenses are the Regular Army, the reserve of ex-Regulars, and the militia. Volunteers must also be considered in the scheme for defense, not as volunteer organizations, but as individuals to be absorbed into already existing organized units.

The recently evolved plan of training volunteer officers in summer instruction camps for students and business men has met with great success. With a supply of graduates of these camps available for volunteer officers, there is to-day a tendency to turn to the old idea of a second line, composed of volunteers in preference to the National Guard.

With the militia already organized, armed and equipped, and more or less trained, it seems at first glance difficult to account for this preference. But the solution is not difficult to find. It lies in the fact that the Federal government has not sufficient control over the National Guard.

In war, unity of action and centralization of control are absolutely necessary, and, therefore, control of the militia must be given to the General Staff, so that it may be possible to co-ordinate the army, the reserve, and the militia into a workable scheme of defense.

With the Guard reorganized and assurance given that its training will be definite and progressive, it would in reality become our

## UNITED STATES—Continued

main army, and the Regular Army would be a sort of an advance guard. Voluntary enrollment of reservists would be in the National Guard, and this would leave the Regular Army free to do its best work as a body of professional soldiers instead of being ruined by being made a skeleton for a big volunteer mob.

Voluntary enrollment as reservists would be open to ex-Guardsmen, graduates of military schools and instruction camps and men who, through business reasons or because of location, could not be active members. They would have no duties in time of peace, but each militia company would keep in touch with its own reservists and would keep on hand their arms and equipment.

The Regular Army reserve would be used to support the army. It should be under professional officers who, in time of peace, would be available for military instruction in schools, colleges and camps, and for the thorough intensive training of the militia.

[Rochester's Recommendations. *Arms and the Man*, Dec 2, '15. 200 words.]

The Rochester, N. Y., Chamber of Commerce has appointed a committee on national defense. The committee will consider the general question of defense and the questions of maintaining a citizen's rifle range and obtaining support for the local militia. It will also seek a means of inducing employers to encourage and assist their employes in enlisting and serving in the National Guard.

[Army Defense Bill. *Army and Navy Register*, Dec 18, '15. 650 words.]

According to the plan laid out by the House military committee for the hearings on Mr. Hay's defense bill, these hearings will begin about Jan 4, and will thereafter be held not less than three times a week.

It is expected that Secretary Garrison, if he desires to communicate his views to the committee, will be heard at the first session.

The first part of the sessions will be devoted to hearings of army officers, militia officers, and representatives of the various societies which have been formed for and against military expansion. There will be heard only one member of each of these societies, so that if public characters, such as Mr. Roosevelt, Mr. Bryan, and Mr. Gardner, are to be heard, each will have to be chosen by one of these organizations to express its views.

Difficulty is anticipated in obtaining the unreserved opinion of army officers, since they will naturally be reluctant to take the attitude of opposing the plans of the administration. This is particularly so in the matter of the continental army, to which President Wilson is committed. There are indications, however, that this feature of the defense bill will be modified or even withdrawn from the measure by the time it is reported to the committee.

[Opinions of the Chief of Staff. *Army and Navy Jour.*, Jan 15, '16. 800 words.]

Before the House Committee on Jan 6, the Chief of Staff stated that he believed it to be the duty of the government to provide for a trained force of 2,000,000 men, and that compulsory military service was the only effective means of raising a big army in time of peace. The General Staff has worked out that Austria could land 72,000 fully equipped men in a first expedition and over 100,000 in a second; that Germany could land 387,000 in a first expedition and 440,000 in a second; France, 160,000 in a first expedition, and 243,000 in a second. Combinations of powers must be considered. Other items were covered by the testimony.

[United States Army. *Information*, Jan, '16. Quoted.]

Secretary Garrison made public, Dec 10, in connection with his annual report, the special national defense report, prepared at his request by the War College division of the General Staff. It showed that the army itself considered that as a proper military policy to secure continental United States from attack it was necessary to have a mobile army of 1,500,000 fully or partially trained men. It made the following specific recommendations for the organization it believed necessary:

Regular Army:	
With the colors.....	121,000
Reserves at end of eight-year enlistment period .....	379,000
	500,000
Continental Army:	
Under training, three months a year for each of three years .....	500,000
On furlough, subject to three months' additional training before taking the field .....	500,000
Organized Militia:	
No provision beyond annual appropriation of \$7,000,000 and repeal of all acts requiring State soldiers to be received into United States service in advance of any other force in time of war.....	
Grand total, regular and continental..	1,500,000

In estimating the cost of this establishment, the report figured as follows for the first year:

Regular army.....	\$258,960,000
Continental.....	87,500,000
Militia .....	7,000,000
Total.....	\$353,460,000

In addition to these figures, Secretary Garrison pointed out in a digest of the special report, an annual expense of \$20,000,000 for each of four years would be necessary for harbor defenses, and reserve material would cost for the first year alone \$129,768,786, making the grand total for the first year \$503,228,786.

It was the cost of the War College plan which led Secretary Garrison to devise the modified plan which had been presented to Congress with the backing of the Administration. Under that plan (see *Int. Mil. Dig. Quarterly*, Dec, '15, p. 394), the first year's expenditure would be \$182,717,036 and a force of 670,843 would be produced within three years,

which would be more than doubled by including the reserves of each branch which would be created within the first six-year continental enlistment period. The annual upkeep cost of the War College plan after the system should come into full operation was estimated as \$319,473,000, as against \$182,234,559 for the Administration plan.

The report contained a table of the military strength of the seven leading foreign powers as of Aug, 1914, and also an estimate of the available shipping for a military expedition to the United States. It said a "reasonable estimate" showed that Austria-Hungary, with a total trained force of 4,320,000 men, could send 180,000 men with all necessary stores and animals across the seas within 40.7 days in two expeditions; France, with 5,000,000 men, 404,226 in 30 days; Germany, with 5,000,000 men, 827,000 in 30.8 days; Great Britain, with 695,000 men, 170,000 in 27 days; Italy, with 2,600,000 men, 227,000 in 35 days; Japan, with 2,212,000 men, 238,367 in 41 days, and Russia, with 5,000,000 men, 104,074 in 40 days.

[A Proper Military Policy—War College Division. *Infantry Jour.*, Jan, '16. Tables. 11,500 words.]

The following statement is in reply to memorandum from the Secretary of War for a military policy, based on the 1912 report for the organization of the land forces of the United States.

National policies are evolved and are expanded as the nation grows. A nation's military policy is the national doctrine of self-preservation. Virile progressive nations are forced to universal service in the effort to fulfill what they conceive to be their destiny. The development of our nation has proceeded under such favorable conditions that there is no well-defined public opinion as to what constitutes a military policy. But our isolation is no longer a safe factor; conclusions from the results of past wars are equally unsafe. Our policy is not sound and public opinion does not as yet recognize this fact. Vaguely the people have felt the danger, as shown by the efforts to provide a navy as a first line of defense and to supplement it with the necessary harbor fortifications. We have failed to recognize, however, the need of a well organized land force. These three elements must be co-ordinated, and until this is done we cannot have a proper military policy for the United States.

Two policies whose maintenance we must consider as necessary to our national life are the Monroe Doctrine and the policy of avoiding "entangling alliances." In addition, policies may develop in the future as a result of international relations with trade conditions. These policies demand defense measures, the more so because of our responsibilities as a nation and our geographical position.

All the other world powers of to-day have realized the necessity of maintaining highly trained and organized military and naval forces in time of peace, and all or nearly all are allied in powerful coalitions.

Should our next enemy be a nation in arms, which is true of all world powers except ourselves and England, the hostile expedition to our shores will be limited only by the number of vessels in the transport fleet. It also follows that as this capacity of transport increases, so will the number of trained soldiers sent increase, and so our trained forces should be correspondingly augmented. A tabulated list shows in Aug, 1914, that in two weeks, 400,000 men can be set down on our Atlantic shores, and in four more weeks 500,000 additional men. This from one power. Figures for other powers are less, but equally threatening. These expeditions can land, by eluding or defeating the navy, anywhere along the coast except on the very restricted areas of our harbor defenses. To meet the enemy on the immense stretches of unfortified coast, we must have 500,000 men at the outbreak of war, and 500,000 to be available not later than 90 days thereafter. Two expeditions overseas will provide a force large enough to cope with this force of ours, therefore a system to raise and train at least 500,000 more men to replace losses and wastages in personnel must be provided. Our military problem is to provide this organized land force. It is assumed in what follows that the navy is preparing to place and maintain in the Pacific, when the occasion requires, a force superior to that of any oriental nation, and in the Atlantic, one second only to that of the greatest European naval power.

Among the many functions of the army, two depending upon strength and organization, are important. The army must form the first line of defense in order to give sufficient time to permit of mobilization and concentration of our greater war forces. Also the army should be so organized and located that it can be economically and efficiently trained, quickly and easily mobilized and concentrated, and readily used as a model in the education and training of the citizen forces.

There can be no fixed relation in the strength of mobile troops and coast artillery. The strength of the latter depends upon the number and character of harbor defenses established; that of the former upon the nature and extent of the defensive and offensive operations for which the nation decides to be prepared.

Oversea garrisons should be maintained at full strength and be organized so as to be self-supporting. The residue at home should be organized with a view to ultimate expansion in time of war into such forces as national interests may require.

It is clear that perfect co-ordination between the army and navy is absolutely essential to success in holding Hawaii, our key to the Pacific. Enough mobile troops must be in the garrison of Oahu to defeat any enemy that may land. There must be enough naval force to keep Hawaiian waters thoroughly patrolled throughout their extent, and to make them dangerous for enemy vessels.

The unquestioned security of the Panama Canal is for us a vital military need. Our

**UNITED STATES—Continued**

control of the canal enormously increases our military and our naval power.

A system of harbor defenses without mobile forces to cover the unprotected interval is not wise. There is not a case in history where efficiently manned harbor defenses have been captured by direct attack from the sea. A rational distribution of mobile forces is necessary to meet this contingency.

A mobile force of reasonable strength must be maintained in northwestern United States. The harbor defenses are reasonably strong. It would be extremely difficult to dislodge an invader once in this region.

A strong mobile force is likewise necessary in California to co-operate with the reasonably strong harbor defenses. Troops cannot be shipped from the east without delay and disaster. Few and very vulnerable passes exist between the east and the west.

The middle west area should be the location of a mobile force for use in case of need, to the east, the west, or to the northern or southern border.

**Regular Army.**—For oversea service the force in Oahu should be 25,000; in Panama 24,000; in Alaska, in time of peace, one regiment (1915 officers and men); in Porto Rico, one regiment. In all including all oversea garrisons, 82,000 officers and men.

For home service a total of 121,000 officers and men. All figures given are those for combatants.

The troops should be organized in higher tactical units and distributed as follows:

In the Puget Sound area,—one division (less divisional cavalry) and one cavalry brigade (of three regiments).

In California,—one division and one cavalry brigade.

In the North Atlantic States,—one division and one cavalry brigade.

In the Middle West,—one division (less divisional cavalry) and one cavalry brigade.

On the Mexican Border:

West of El Paso,—one cavalry brigade.

East of El Paso,—one cavalry brigade.

Basing figures upon the manning by the regular army of all mine fields and oversea guns and one-half the guns at home, the estimate of the Chief of Coast Artillery is 289 companies or 34,413 men for all services, gun and mine.

Combining all estimates, the following strength in units appropriate to each arm results:

- 65 regiments of infantry.
- 25 regiments of cavalry.
- 21 regiments of field artillery.
- 289 companies of coast artillery.
- 15 1-3 engineer battalions.
- 10 Signal Corps battalions, (including aero squadrons).

Which totals:—Mobile forces, 195,500; Coast Artillery Corps, 34,500; grand total, 230,000. Including Philippine scouts, Quartermaster, Ordnance and Medical departments, the total is 281,000.

**Organization.**—Infantry companies should have the full statutory strength of 150 men. Machine gun and supply units are in great need of reorganization.

**Organized Militia.**—No legislation is recommended for the organized militia beyond the repeal of all provisions of laws now in effect whereby militia must be received into the federal service in advance of other forces.

**Reserves.**—The first reserve, to bring our first line up to a strength of 500,000 should consist of 379,000 men. This force can be secured in eight years. At least 500,000 more fully trained mobile troops should be ready to take the field immediately upon the outbreak of war. The minimum intensive training that will prepare troops for war service is twelve months. These troops should have had this. Commissions as reserve officers should be given to United States citizens who are fitted and who pass an examination to be prescribed by the Secretary of War. Regular army officers, one at least to every 400 men, should be assigned to the reserves for training. Organizations and specially designated n.c.o.'s to be used likewise.

**Volunteers.**—Provision must be made for their entry into the service. Two defects of the present statutes should be remedied.

**Reserve Matériel.**—Supplies must be accumulated in advance. Certain kinds can always be procured and need not be specially provided, but the great bulk can not be so well nor so cheaply acquired in time of war. As a general principle, no supply depot, arsenal, or manufacturing plant of any considerable size should be established or maintained by the War Department east of the Appalachian mountains nor west of the Cascade or Sierra Nevada mountains, nor within 200 miles of our northern or southern borders. Steps should be taken gradually to cause to be moved such depots, etc., already established in violation of this principle.

**The estimated cost.**

**Regular Army.**

First year .....	\$258,960,000.
Per year thereafter .....	\$249,973,000.
Organized Militia, per year	\$7,000,000.
Continental Army.	
1st year .....	\$87,500,000.
2nd year .....	\$70,000,000.
3rd year .....	\$85,000,000.
4th year .....	\$62,500,000.

[To Make Preparedness Permanent. By Capt. John L. DeGroot, 1st Oklahoma Inf. *The National Guard Magazine*, Feb, '16. 2500 words.]

That the faults of the present military system of the United States are many is shown by the fact the War Department finds it difficult to recruit the present ridiculously small army. There are certain causes which explain this unwillingness to enlist in time of peace. One is that, despite the high standards set for the recruiting service, sufficient undesirables get in the army to lower its standard of morality.

Another reason is that, after several enlistments, the soldier is not fitted for civil pursuits. An ex-soldier finds that by many employers he is discriminated against, and even after securing a position he finds himself handicapped by others who have spent their early manhood at that particular kind of employment. He cannot see that his service in the army has benefited him. There must be considered also two other very grave faults in our system: first, no reserve; second, a lack of officers.

All of these defects are very serious, and any legislation which does not fully remedy them all is faulty. The army must be made an attractive place for our best and most ambitious young men and unattractive for those young men not possessing these desirable qualifications. It must be such a place that a young man, after serving his required period, will cheerfully and willingly step aside for his younger brother, and his discharge certificate must be such a good letter of recommendation that civil life will offer him even greater inducements than the army. During his enlistment every soldier should be carefully trained and instructed in the production of some article necessary to the efficiency of the army. This knowledge, in addition to making the ex-soldier self-supporting in civil life, may be of great help to the government when the soldier is too old to carry a gun. Legislation must also provide for furnishing in time of war great numbers of trained officers, and also for an adequate, growing reserve.

In constructing this legislation the desired new organization must be considered as if the old one had never existed.

The army must be converted into a university in which the soldier, in addition to being perfected in his military duties, is also instructed in that class of civil pursuits to which he seems best suited. For instance, if a man has a tendency toward medicine he should be carefully trained in the duties of the sanitary troops.

The Military Academy cannot supply all the officers that are needed, and it is believed that under the proposed system the enlisted personnel will be so high and its training so thorough that every year many men can be commissioned from the ranks.

At the beginning the cost of this system would be very high, owing to the fact that expensive schools and factories would have to be installed, but once the system is fairly started the work performed by the soldier will more than pay for his training.

The plan would not only furnish to the United States an excellent system of preparedness, but would also give it the first place, industrially and educationally, among the nations.

[An Army of the People. *Army & Navy Register*, Mar 25, '16. 2500 words.]

(A review of a book by this title by Major J. McA. Palmer, 24th Infantry, published by G. P. Putnam, New York. The book describes the formation of a citizen army, in-

cluding the details of training, provision of officers, etc., under the assumption that Congress passes enabling legislation which receives Presidential approval Feb 16, 1916. It is in effect a project for training an annual contingent of about 320,000 men. The book is described as "of consuming interest and importance.")

[The Army Bills in Congress. Editorial. *Scientific American*, Apr 1, '16. 2200 words.]

The Chamberlain bill gives to the regular army an authorized strength of from 178,000 to 240,000, the Hay bill of from 155,000 to 172,000, against a present authorized strength of 87,240 to 120,000. Of the two bills, the Chamberlain bill is preferable, and is satisfactory except in its provisions relative to the militia. These provisions are similar to those of the Hay bill, and appear to show the same guiding hand.

In militia provisions, both bills rest upon the assumption that a decision of the Supreme Court, dissented from by Justice Story, our ablest constitutional lawyer, can be extended to cover the following provisions of the bills:—

"That only certain classes shall be eligible to appointment as officers of the National Guard;

"That its officers shall be appointed by the President;

"That the general government shall prescribe the number of drills;

"That the general government can require the National Guard to participate in maneuvers;

"That the President may prescribe the special units to be maintained in each state, and may require a reserve for each;

"That, when Congress has authorized the use of land forces, the National Guard may be required to perform any service within or without the continental limits of the United States."

These are necessary and desirable features of any reserve force, but it is stipulated that the National Guard shall be a division of the militia, hence Constitutional provisions apply, thus nullifying these features whenever any one cares to contest them.

For national security, we need five things:

- (1) A strong, well-balanced, and fully manned Navy;
- (2) A regular army of sufficient strength in conjunction with our navy, to protect our out-lying possessions and guard our vitals long enough to allow us to mobilize our resources;
- (3) A federal citizen army which will be ready for service after three additional months' service;
- (4) A system of universal training for our youth;
- (5) Organization of our great resources for war.

See also

NATIONAL GUARD (UNITED STATES)  
UNITED STATES—MILITIA

**UNITED STATES—Continued**

[Forgotten Lessons. By Major H. C. Davis, U. S. Marines. *Jour. Mil. Service Institution*, May-June, '16. 5000 words.]

Gen. Washington had ample opportunity to observe the workings of our military policy. His writings (Sparks, "Writings of Washington") contain many passages showing his opinion of militia. "To expect the same service from raw and undisciplined recruits as from veteran soldiers is to expect what never did and never will happen." Many other citations show the unreliability of militia troops. Gen. Henry Lee ("Light Horse Harry") said that he was convinced "that a government is the murderer of its citizens which sends them to the field uninformed and untaught," there to meet disciplined soldiers. (The purport of the article is a warning against reliance in hastily organized troops, and ends with a plea for preparedness.—Ed.)

[Business Men for Adequate National Defense. *Infantry Journal*, May, '16. 1700 words.]

Business men want preparedness. The referendum of the Chamber of Commerce of the United States brought out the biggest vote ever recorded from the commercial organizations which make up the Chamber. On the general preparedness recommendation, it resulted 970 in favor as against 8 opposed. On universal military training, 889 in favor and 56 opposed.

A Council of National Defense was proposed, and also a Staff of Industrial Mobilization, so organized and maintained in time of peace as to insure the most effective use of the economic resources of the United States in case of war.

See also

**COLLEGES—MILITARY TRAINING IN**

**GUAM**

**MILITIA**

**MOBILIZATION OF NATIONAL RESOURCES—**

**UNITED STATES**

**MONROE DOCTRINE**

**NATIONAL GUARD (U. S.)**

**PREPAREDNESS FOR WAR—MOBILIZATION**

**OF NATIONAL RESOURCES—UNITED STATES**

**RAILROADS—MILITARY CONTROL OF—UNITED STATES**

**UNITED STATES—COMPULSORY MILITARY**

**SERVICE**

**UNITED STATES—MILITIA**

**—Military Policy of—Business Men's Instruction Camps**

[Rear-Rank Reflections. Anon. *Unpopular Review*, Jan-Mar, '16. 4000 words.]

(Note.—This is written from the standpoint of a "rear-rank private" at the recent camp of instruction at Plattsburg, N. Y.)

Our first reflections concerned organization. Here we were, thirteen hundred eager, unskilled men from civil life, parodying what happens when our country goes to war. A miracle of transformation was wrought upon us. In two days we had ceased to be a mob.

In a week we had got by the first appalling fatigue. In a fortnight we had developed out of nothing our own noncommissioned officers. Three weeks had made an effective if ragged regiment of us.

It needed little reflection to see that the health, order, and spirit of Plattsburg could never be improvised. These depend upon long founded experience and intelligence. I imagined what would befall us if all the cooks, doctors, officers, and regular privates were suddenly withdrawn and the "Business Men's Regiment" left to its own devices. Even in time of peace the result would be calamitous.

A more ominous reflection came on the first day of combat tactics in open order. Suppose this were not the end of a drill, after two weeks of amateur soldiering, but the beginning of a battle, after two weeks of real war. Who would teach us to shoot twice a minute and to roll over when to rise were death? Not our present captain and lieutenant, not our smiling and steely-eyed regular sergeant, but just willing duffers like ourselves, fighting by day and learning how to fight out of "Infantry Drill Regulations" at night. As things go in modern war, should the regular army have to face a powerful foe, there would in a month be no regular army. The funded military intelligence of the nation would be shot to pieces in just about four weeks. The men who could make soldiers out of the million men, who we are assured would spring to arms, would be themselves in soldiers' graves or lying unburied.

To imagine ourselves in any sense protected because the American is a natural fighting man is the last folly.

After a month we could march, camp, shoot, take care of ourselves, maneuver a few hours a day. I think that perhaps a quarter of us had hardened enough to do much more than was required of the regiment, but most of us were still far from fit to stand the physical strain of actual warfare. Here is a whole side of preparation for war about which there is the wildest misconception. People cannot realize that a stalwart untrained citizen is no more physically fit to fight than a sturdy untrained freshman is fit to step into a football match.

[Note. *Army and Navy Jour.*, Jan 1, '16. 150 words.]

Gen. Wood states that 15,000 business and professional men in all parts of the country are taking military instruction during the winter under National Guard and Regular Army officers. About 10,000 men have signified their intention to attend the various training camps during the coming summer.

**—Military Policy of—Continental Army**

[The Continental Army Bill. By Captain Richard Stockton, Jr., New Jersey National Guard. *Infantry Journal*, Feb, '16. 2750 words.]

In spite of the opposition to, and even the ridicule of, the Continental Army, the step marks the greatest of all military advances made by this nation. It establishes the princi-

ple that national defense is national and not local. Federal control will be a recognized principle of our military policy.

This bill is, however, far from perfect.

(1) All male persons owe military service to their country, and only proper and necessary exceptions should be made.

(2) The training period is too long, as the more important positions require a type which, generally speaking, cannot devote two or three months annually, on account of business duties.

(3) The Continental Army should be subject to the laws and regulations of the regular army not only when called out, but at all times.

(4) Officers of the Continental Army should be permitted to serve with the regular army, as are members of the Officers' Reserve Corps.

(5) The bill makes the error of recognizing a state-controlled militia as part of the military force. The expenditure of money on militia is wasteful.

What is needed by the militia is federal control, uniform standards, freedom from politics, experts for leaders, freedom from unnecessary strike duties, longer field training, and a proper proportion of the various arms.

The Continental Army and the militia cannot exist side by side, but each force has features which are essential to the other. The needs of the militia have been stated; the Continental Army needs many good National Guard officers, its armories, officers' schools, rifle ranges, etc.

To encourage states to turn over their militia, governors should be allowed to use the Continental Army within their respective states, in case of serious domestic urgency. Proper provisions will prevent unnecessary use, and will remove opposition to the federalizing of the militia.

The withdrawal of federal aid will leave to states but two alternatives of which there is but the one choice, to permit the militia to transfer to the Continental Army, and to turn over their armories and equipment at a nominal rental. This procedure would save every cent now spent and would give the states a better force.

A citizen soldiery which will afford security is impossible under the proposed legislation. Will not our law-makers recognize the facts, or are they so careless of the great national issue?

(Five detailed provisions and proposed amendments to correct the aforementioned defects are given in the original text. They are not capable of further condensation.—Ed.)

#### —Military Policy of—Students' Summer Instruction Camps

[The Presidio Camp, July 10 to Aug 15, '15. By Capt. Allen J. Greer, 16th Infy. *Infantry Jour.*, Nov, '15. Photo. 2200 words.]

A provisional squadron of the 1st Cavalry, one company of infantry, an ambulance company, and a detachment from the Bakers' and Cooks' School, were assigned to this camp, which was commanded by Major James G. Harbord, 1st Cavalry. 210 students, representing 28 different states, reported for duty.

The location of the camp was not perfect inasmuch as no target range was available, nor was there room for maneuver. Students were grouped by colleges or localities, and these groups again divided into college and high school students. The first two days were given over to organization of student companies, and to lectures by senior officers on subjects pertinent to camp, its purposes, sanitation, etc.

Three companies under student officers composed the provisional battalion. The work was graded successively, elucidated by many lectures and practical applications. Mr. Roosevelt was a speaker at camp, and he replied to a circular letter of the Collegiate Anti-Militarism League.

Demonstrations in bridge-building, pack and wheeled transportation, demolitions and use of explosives, were given the third week.

Machine guns, field guns, the duties of sanitary troops, and special talks by officers on various subjects were very important features of the extra work of the camp.

The regular duties took up the morning. The afternoon was devoted to optional work in cavalry, first aid, rifle practice, war games, and signal work. The optional idea is believed to be somewhat out of place in military instruction.

Practice marches, advance and rear-guard work, tactical walks, and out-post work were given consecutively. The college men were markedly superior to the high school and preparatory school young men, and camps in future should be open only to college men. Camps should not be located too near the distractions of a city. All officers have become enthusiastic supporters of the student camp idea.

[Student Camps of Instruction. The Ludington Camp, July 5-Aug 8, '15. By Lt. R. A. Hill, 7th Infy. *Infantry Jour.*, Nov, '15. 2200 words.]

This camp was ideally located on the east shore of Lake Michigan, two miles from the city of Ludington. The terrain is admirably suited to maneuvers, and the weather cool and invigorating. This section is frequented by people of education and refinement, and a better atmosphere for the handling and training of the young man could not be desired. Capt. C. W. Weeks, 28th Inf., was in command. An infantry company and one cavalry troop were assigned to this camp. One hundred and fifty students, representing sixty-one institutions of learning reported for work, and were equipped and formed into companies of fifty men each, with student officers so far as possible. Two days of drill in Manual and the Schools of the Soldier and the Squad were followed by close and extended order in the School of the Company. Close order drill was at a minimum. The first period daily from 6.10 to 10.45 a.m. was routine and practical; the second period, 11.00 to 12.00 m., was devoted to theoretical instruction by company commanders on pertinent subjects, or by selected officers on various

## UNITED STATES—Continued

necessary subjects. The third period, 1.00 to 4.00 p.m., was devoted to military instruction. This period was voluntary, but was so well attended that arrangement into sections was necessary. The first two weeks' instruction included battalion close order deployments, and an attack upon an outlined position.

The third week was taken up by target practice, including range discipline, handling of targets, etc., practice marches with advance and rear guards, patrols, and outposts.

The fourth week included record firing, company practice marches, and problems of various kinds. A student war strength company was drilled in open and close order, and intrenched itself.

Addresses by visiting officers, a weekly paper issued by students, a field day, baseball games, band concerts, as well as an amateur play, were enjoyed by the entire camp. Great enthusiasm was shown for the work, and the physical improvement of those in attendance was quite noticeable.

## —Militia

[The Citizen Soldier, His Duty to the State. Address at Baltimore Business Men's Camp of Instruction, Sept 26, '15. By Major I. L. Hunt, U. S. A. *Infantry Jour.*, Nov, '15. 5400 words.]

Discussion of war and peace is but of place here. Military men regard war, statements to the contrary notwithstanding, in the same way that sanitarians regard epidemics. Statesmen must keep us out of war; it is the soldiers' duty to restore peace when the former has failed.

Ruskin has said that there are five professions working for the state: those of teacher, physician, lawyer, merchant and soldier. Also that it is the duty of all these on due occasion to die for the state.

The Bible in the most erudite versions does not lend itself to the belief that the kingdom of God dwells in the hearts of all men, or that universal peace was heralded by the shepherds.

The military force is determined by the military problem. What is the nature of this problem? In brief and first in importance, our laws must be enforced. Second, international police purposes require a military force. Since 1898 we have landed troops in and thus violated the sovereignty of Spain, China twice, Cuba once, also Nicaragua, Mexico, Haiti, Colombia, and Panama. We have armed forces on the soil of four sovereign states at this moment. Third, in event of disaster to our fleet, we must be able to defeat any landing force of a single expedition.

How are we to solve the military problem above? What is the nature of our military force? We have three classes—trained, semi-trained, and untrained. The prejudice against the first class, a regular army, is as illogical as it is absurd, as shown by the study of our own history or the history of any other nation. It arises from the fact that British soldiers in colonial days were stationed in the United States, to be supported by ourselves.

These soldiers were the most tangible evidence of "Taxation without representation." Washington and other foresighted men prevented the anomaly, "Standing armies are dangerous to liberty," from being included in our present "Bill of Rights." Do we fear that the crew of a transatlantic liner will seize the ship and become international pirates? Just as logically we might reason that a standing army will be untrue to the government that supports it.

Later-day prejudices are based upon: its cost, which is many times augmented (1) through politics, and also through lack of policy. In this the War Department shares the blame, though handicapped again by politics; (2) the belief that soldiers are non-producers—not a broad-minded belief, and entirely refuted if we accept Ruskin's analysis; (3) a belief that armies are undemocratic. The world contains two classes—those who command and those who obey. All business activity comprises these two classes fully as much as an army. Is Switzerland's system undemocratic? (4) Fear on the part of labor. If disorder must follow a strike and a boycott on the part of labor, then labor must use its best efforts to see that proper civil police forces are maintained, as state constabulary.

The second asset, the semi-trained force, is the organized militia. Its personnel is as American as any other, but the system condemns it. Control vested in each state and not in one central head would wreck any system, business or national. Consider a through railroad with separate organization and equipment in each state through which it passes. How long would such a business proposition last? Our boast of being practical in matters of government suffers when one thinks of the irreconcilability of the principles of state-controlled militia with an efficient military policy for the nation.

The most patriotic action possible would be for a convention of governors and influential citizens to ask Congress now to forsake a system which has failed us in every war since the formation of the government.

Our third military asset is the untrained element. Herein lies our greatest military problem. There have always been two forces at work in the world, one of which demands freedom of the individual, the other duty to a superior. Abuse of the former leads to anarchy. We have traveled too far on this road to individual freedom, and have neglected too much our duty to the state which makes it possible for us to live. Nothing can bring about more effectively the retaking of our just burden, as regards the state, than the compulsory military service of the youth of the land in a national militia.

Washington himself proposed to adopt compulsory military service in the United States in 1790, in a report to Congress. This opinion of our greatest American may well have even more weight and logic to-day than when first expressed.

Our greatest defect of character is lack of discipline, which gives rise to smartness, boastfulness and superficiality. The average num-



ber of citizens annually killed and wounded through lack of discipline on the part of our public servants and employees is greater than the combined annual average losses of the Japanese in their war with Russia, the Union losses in the Civil War, the English losses in the Boer War, the French and English losses in the Crimean War, and the United States losses in the wars with Spain and Mexico. Our indiscipline represents an annual economic loss of about \$400,000,000. Hugo Münsterberg, criticising the ridicule of the people for expert judgment and thoroughness, the denunciation of discipline and authority, says the training of an army can never begin in Plattsburg camps; it must begin in the nursery and in the little schoolroom.

Lack of discipline murdered the victims of the *Eastland*; lack of discipline will protect the murderers. The remedy for such a spectacle must be found first in home and school discipline, and then in compulsory national education in citizenship for the youth of the land, modeled on the plan of Washington. The attitude of the citizen toward the state must be changed, and national preparedness will solve itself.

[The Division of Militia Affairs. *Army and Navy Jour.*, Jan 1, '16. 1000 words.]

(Comments upon the report of the Chief of Division of Militia Affairs.) Every encouragement has been given to the formation of new machine gun units, even though the regular army units have still only a provisional organization. Thirty-five units have been formed and others are soon to be added. Twenty-one units attended special camps of instruction, the principal feature of the instruction being target practice. The present type of machine gun is to be replaced by the improved Maxim; but it will not be supplied for about two years. A special estimate of \$1,800,000 is submitted for new machine guns to complete the full divisional equipment.

Many militia field batteries have had no opportunity for mounted instruction, and there is a general lack of facilities for sub-caliber practice. Low rating in armory practice shows lack of appreciation of the importance of armory drill.

Only about one-third of the organized militia had sufficient training in rifle practice to render them of any immediate value on the firing line. Facilities have not been utilized and there seems little excuse for this condition.

Substantial progress has been made in supplying wagon transportation and harness necessary for field and combat trains, all but 10% of the full quota having been provided.

[Inadequacy of a Militia Army. *Army & Navy Jour.*, Mar 11, '16. 1300 words.]

(A letter from G. C. Merriman, late Captain, Penna. Nat. Guard, published on the editorial page as expressing the views of the *Army & Navy Journal*.)

Some of the outstanding statements are:—The glaring weakness of any force we may

raise must be in its officers; for years the National Guard has been taught to believe that the standard of the regular army is unattainable, but this standard can be attained with the support of commanding officers; the National Guard, as it exists, would be useless for a sudden war, for it is not sufficiently trained to stand against well trained troops; federalization will not automatically make the National Guard efficient; the ranks are not full even on a peace basis, and war strength means the addition of many recruits; the regular army at the outbreak of war could not spare officers to train any militia; it takes two years, not two weeks, to make an infantry soldier of any value; we should prepare for contingencies immediately by a substantial increase in the regular army, and the organization of a reserve of volunteers. The first move should be to create a body of officers, selected by examination, and given a course of intensive training.

[Note. *Army & Navy Jour.*, July 8, '16.]

The Census Bureau on July 3 estimated the number of able-bodied men of military age in the United States at about 21,000,000. This allows a 10 per cent. increase since 1910, when there were 14,224,000 native whites, 2,857,000 naturalized foreign-born whites, 2,052,000 negroes, and 50,000 Indians. New York, Pennsylvania, Ohio, and Illinois have each more than 1,000,000 men of military age.

See also

NATIONAL GUARD (U. S.)  
UNITED STATES—MILITARY POLICY OF  
UNITED STATES—ARMY—RESERVE

—Munitions and Munition Materials—European War Orders for

See

EUROPEAN WAR—MUNITIONS AND MUNITION MATERIALS—ORDERS FOR IN U. S.

—Munitions—European War Orders for

See

EUROPEAN WAR—MUNITIONS AND MUNITION MATERIALS—ORDERS FOR IN UNITED STATES

—Munitions—Manufacturing Facilities

See

MUNITIONS—MANUFACTURING FACILITIES OF—UNITED STATES

—Navy

See also

MOTOR BOATS—UNITED STATES

UNIVERSITIES

See

COLLEGES

—Military Training in

See

EDUCATION, MILITARY—IN SCHOOLS AND COLLEGES

VENEZUELA

—History

[General Piar and the Saint Louis Keys Expedition. By Lieutenant J. Zornosa A., Infantry. *Mem. Estado Mayor* (Colombia), June, '16. 1100 words.]

## VENEZUELA—Continued

(A historical sketch dealing with the operations of General Piar and his expedition from Saint Louis Keys, Haiti.)

In 1817 this expedition landed in Ocumare, Venezuela, thereby establishing a base for the future operations which brought about the independence of New Granada.)

## VERA CRUZ

—U. S. Operations at in 1914

[The Seizure of Vera Cruz. A Mexican Version. By César Reyes Aguirre. Translated by 1st Lt. J. C. Chaney, 25th Infy. *Infantry Jour.*, Nov, '15. 5000 words.]

(An account under the following heads: The motives (to assist the Carranzistas); A little history (of Vera Cruz); A treacherous assault (bombardment of unfortified town without due notice); The first shot (how the fight started); Occupying buildings; They intrench; The Naval School; A new advance; The defense of the Naval School (the gallant defense of the Naval School buildings by 70 naval cadets); The bombardment of the school (by field artillery); The Americans take the school; Officials announced (Rear-Admiral Fletcher's order, continuing municipal officials in office).

## VERDUN, Battle of

[The Meaning of Verdun. Editorial. *Independent*, Mar 20, '16. 1500 words.]

The German attack upon Verdun is one of the most important operations of the war. Success will break the strongest barrier on the road to Paris, and failure means a serious loss of prestige. The gain of a hundred square miles of territory is a striking triumph, but unless the Germans finally break through, such a gain is of no avail, and will merely repeat the experience of the French and British, that the first line can be smashed in but not broken through. British press correspondents state that the French and British have dug twenty miles of trench for every mile of front, or 10,000 miles in all.

Although the French claim to have been aware of the German plan, if they were not surprised by the German attack they were not fully prepared for it. Gen. Pétain was called from his bed at night to take command of the defense on two hours' notice. It is reported that Australian and Canadian troops are fighting at Verdun, and that the British have extended their lines in Artois to release additional French troops. These reports indicate radical rearrangements to meet the stress.

Verdun was regarded as a fortress of tremendous strength, but opinions on that subject have changed since the war began. It has been repeatedly besieged, the last time in 1870.

The attack upon Verdun was probably instigated as much by political as by military strategy. Undoubtedly by seizing the initiative in attacking Verdun, the Germans have

disarranged the Allies plans, perhaps with important consequences in other theaters.

[The Advance on Trebizond and Operations before Verdun. By Hilaire Belloc. *Land and Water*, Apr 20, '16. 7000 words. 3 sketches.]

*Operations Before Verdun.*—After the great attack of Apr 9th, which continued partly through the 10th and failed with exceedingly heavy losses, the Germans remained a whole week reorganizing broken units, probably bringing up new men, and certainly replenishing the stock of munitions. On the 17th, the attack was renewed upon one of the old fronts, in the same fashion and with the same result: that is, the usual allowance of 20 men to the yard; the front of about 2000 yards; the crushing losses; the retention of a few yards of advanced trench; the picking up of a certain number of wounded, and of a less number of unwounded prisoners, and the exaggeration of their number in an official communiqué. The story of such an attack is the story of half a dozen others. In this case the section of advanced trench taken was a little salient just south of Chauffeur Wood. (Here follows a discussion of the French tactics and a reiteration of previous statements to the effect that the German idea is probably

(a) to gain the political advantage that the capture of Verdun would give and

(b) to break down the French morale by constant hammering.

The object of the defensive is to exhaust the Germans, and to make them pay the highest possible price for what is conceived to have been an error on the part of their higher command.

Under caption "False Enemy Figures," certain discrepancies are pointed out in the official lists of prisoners taken issued by the German Publicity Bureau under the authority of the German government.

Under "Note on Certain American Figures" the official estimates of the General Staff of the United States as to the permanent losses of the various forces in the European war up to the end of 1915 are characterized as incorrect and valueless in so far as they relate to France, Austria and Germany.

Public opinion in America is held to be influenced largely by the so-called German press propaganda, and the writer is impressed by the necessity of taking definite steps properly to instruct American opinion.

[The Tigris Campaign. Strategic Value of British Operations in Asia Minor. Situation on the Verdun Sector. By Hilaire Belloc. *Land and Water*, Apr 27, '16. 6700 words. One sketch.]

(Only the part relating to Verdun is given here. The remainder of the article will be found elsewhere under its proper heading.—Ed.)

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*Situation in the Verdun Sector.*—The present lull in the operations before Verdun has lasted nine days. This is longer than any similar interval since the operation began.

It has been conjectured from the gradually extending series of spaces between each important assault that the attack was being allowed to die out. Evidence of what the heaviest guns are doing—whether they are still firing and from where—would be decisive as to this.

It is now the tenth week of the affair. Over forty separate attacks have been made, twelve upon a front of from two to nine miles, with from one to perhaps seven divisions actually engaged. The enemy is believed to have over 115 divisions on the western front. Thirty divisions have been identified in the Verdun attack. An offensive so directed, so prolonged, and so restricted to narrow fronts, is enormously more expensive than the corresponding defensive. There is no superior convergence of fire against the French. The salient is not sharp enough for that. The total enemy losses are now well past 300,000. The successful defense of Verdun will be the classical example in the schools of the future.

[The Battle of Verdun. By Henry Bidou. *Revue des Deux Mondes*, May 1, '16. 13,000 words.]

The general situation at the end of 1915 was as follows: From the beginning of the war, the total strength of the Allies was known to be much superior to that of the Central Empires; the Germans themselves recognized this, not without pride. On the other hand, the Central Powers had two advantages: more geographical cohesion and better preparation. They had two means of gaining the victory. One was to disassociate their allies. In this, their efforts have been vain; the union of the Allies has become closer and closer, and their collaboration more and more efficacious. The other method of conquering was for the Germans to profit by an excellent organization to beat their adversaries before all were ready, and first the French; in a word, to re-enact the combat of the Horatii. This method has likewise failed. The French, at first thrown back to the Marne, have repulsed the Germans as far as the Aisne and raised a wall from the sea to the Vosges that could not be broken. The Russians, thrown back on a line running from the Dvina to the Dneister, have withdrawn without being broken, and have stopped the exhausted enemy. After eighteen months of war, it became evident that the Allies would not attain their full strength till the spring of 1916, whereas the Germans would have already begun to wear themselves out beyond remedy.

The German contingent of 1917 was called out in Dec, 1915, and Jan, 1916. In July, 1915, they had incorporated the untrained *Land-sturm* from 35 to 45 years old, and in Oct and Nov, 1915, they had accepted the men formerly declared unfit for service. In other words, at the end of 1915, Germany had raised all the men available from normal resources, while the Allied possibilities for recruiting had practically no limit. Force of circumstances, if it had time to produce its effects, condemned the Germans to defeat.

They knew it and decided to conduct the war conformably. They had often proclaimed, in the course of 1915, that this war would be a victory of mind over numbers. The resources of the mind had then to be drawn upon. They had succeeded in enlisting Turkey in their cause. They succeeded, likewise, in Oct, 1915, in winning over Bulgaria. They were thus in a position to create a diversion in the Orient at relatively little cost. Not only did they succeed, by conquering Serbia, in bringing to Salonika a powerful Franco-English army which has thus been kept far from the main theater of operation, but, by opening the road to Constantinople with a big noise, they disturbed England by the threat of an expedition to Egypt.

Did they themselves believe in such an expedition? Did they think that this threat would divert England from a more effective participation in the war on the French front? Did they simply wish to retain, if only temporarily, large Allied forces in the eastern Mediterranean? This much is certain, that, at the beginning of 1916, they had only 3 divisions at most left on the Serbian front, and more probably 2. Moreover, they had, in a general way, given over to the Austrians the whole front south of the Pripet, and left to the north of that river, from the Gulf of Riga to Pinsk, only about 50 divisions. And they were about to seek the decision by a victory on the French front.

They claim now that this operation was purely defensive. They say that they had to disorganize the preparations for a general Allied offensive in the spring. It is too evident that by ascribing to themselves a plan relatively so modest, they will always be able to claim success in it. In order to demonstrate it, they forge a whole romance. An anonymous correspondent of the *Berliner Tageblatt* claimed, on Apr 15, that the French had premeditated an offensive against Metz for that date. The Germans had probably known this design as early as January, and the Battle of Verdun must have put an end to it. This invention has naturally the object of reassuring the German public opinion by showing that the battle has not been without effect.

The Germans play on words. They are, indeed, conducting a strategic defensive, but by means of a tactical offensive. Whatever may have been the distant aim of the battle, it has been conducted like an offensive battle of the largest proportion, with the immediate design of annihilating the adversary.

## II

Why has this battle been waged in the Verdun zone of operations?

The reasons for this choice can naturally be determined only by conjecture. A certain number of them are, however, apparent enough.

Picture, facing the east, the central position prepared by the French on the Meuse, after the war of 1870. It is a sort of dike, terminating in two jetties—Verdun at the north, Toul at the south. In advance, nearer the enemy, Nancy.

### VERDUN, Battle of—Continued

This dike leaves two channels open, one at the south between Toul and Epinal, the other at the north, between Verdun and the Ardennes. The war of 1914 comes. The southern channel is forbidden to the enemy. The dike itself holds firmly. The enemy cannot even seize the advanced position of Nancy. The invasion has to pass by the northern channel. For that it has to go around Verdun, which remains in our hands. It is on Verdun that the armies which deliver the Battle of the Marne rest their right flank, while their left rests on the entrenched camp of Paris.

Thus Verdun, in Sept, 1914, forms an angular bastion, advancing into the enemy's lines, between the group formed by our 2d and 1st armies in the east and the group formed by the 3d, 4th, 5th, 9th, and 6th Armies, and the English Army in the west. However, the Battle of the Marne is won. The Germans seek an immediate revenge. They will find it on our right flank. This Verdun-Toul dike, which they went around at first, they are going to take by surprise. They boldly scale the Hauts-de-Meuse half-way between the two fortresses. They find there only a few elements of the 8th Corps, which fall back. On their heels, the Germans reach the Meuse, in the very center of the dike, at Saint-Mihiel. They can go no further. But there, as elsewhere, they stick. They form between Les Eparges, Saint-Mihiel and Apremont a corner held for a long time by the Bavarians.

Verdun is thus surrounded on the greater part of its circumference. In the winter of 1914 and the spring of 1915, the French, it is true, give themselves some breathing space. In Oct, 1914, they extend notably their positions towards the north; in Apr, 1915, they advance eastward nearly to Etain. At the southeast they take the position of Les Eparges. Nevertheless, Verdun still presents an angular bastion, an exposed and besieged salient. It is, therefore, like all salients, a zone designed for a great effort by the adversary.

Another consideration must, moreover, be taken into account. A central position like the line Verdun-Toul serves two purposes. In case of a defensive war, it serves as a support to the field army. In case of an offensive war, it serves it as a base. By seizing Verdun, the Germans would ruin one of our offensive possibilities. They have naturally taken advantage of this idea with German public opinion; it was their game. They have shown Verdun as the gate of France to sustain the courage of their compatriots by hope; and to sustain it by fear, they have pointed out Verdun as the gate of Germany.

Moreover, the importance of the region is so little doubtful that the Germans have constantly maintained considerable forces there. Examine their order of battle in the course of Sept, 1915, before the Battle of Champagne; you find two armies, especially strong, the VI on the Artois front and the V on the Verdun front, its right wing in the Argonne. It comprises the equivalent of 6 army corps. It is

largely composed the *élite* troops, and is commanded by the Crown Prince. It is very evident that this large force was there for a definite purpose.

### III

What were the tactical conditions in this zone?

From Paris to the Moselle the terrain presents a regular succession of plateaux. Imagine a pile of books which has fallen towards the left, the books sliding on one another; they overlap; they are spread out in the direction of width. That is exactly the topography between Paris and Metz. The sixth plateau is formed of wide blocks of hard limestone. Solid and massive, it covers a wide extent. The Meuse has worn for itself a north and south passage, without breaking the unity of the plateau. The limit of the plateau is about 10 kilometers to the east. There it stops, and its edge (like the edge of a book in the pile of books), dominating abruptly the plains of Woëvre, is called the Hauts-de-Meuse (Heights of the Meuse).

It is this plateau of hard limestone that constitutes the region of Verdun. Reduced to its geometric form, it is a plane inclined towards the west. There it has an elevation of not more than 250 meters; to the east, where it culminates at Douaumont, it is 388 meters. To the west, its declivity plunges under the hills of Esnes. To the east, its highest point dominates the Woëvre. The Meuse crosses it from north to south.

This regularity is interrupted by two facts. The first concerns particularly the right (east) bank of the Meuse. This river, which is in itself no more than a canal parallel to the ridge on which the plateau terminates, receives tributaries from this ridge. The ravines in which these branches flow, starting at the level of the ground, soon become very deep. The one joining the river near Bras is cut to a depth of 140 meters in the distance of 4 kilometers. Other ravines, instead of going down to the west towards the Meuse, descend to the east towards the Woëvre; their formation is the same. The most important for the history of the battle starts between Fleury and Douaumont at 320 meters. Less than 4 kilometers farther on, after having gone through the village of Vaux, it enters Woëvre at only 250 meters. Between these two systems of ravines, there is a separating ridge, a line of division, which alone in this cut-up terrain forms an even summit. One may easily guess that this summit is the key to the whole position. It dominates the whole region and commands in every direction all the heads of the ravines; it is the plateau of Douaumont.

The second phenomenon which alters the regularity of the country is observable on the left bank of the Meuse. We have seen that the Verdun plateau buried itself on this side under the hills of Esnes, whose steep cliffs dominate the plain. But these cliffs project on it islands which are like warts on its surface. The hills of Esnes project on the Verdun plateau northwest of the city, the observatory of the Mort-Homme. It is formed by

twin hills, the lower at the northwest (265 meters), the higher at the southeast (295 m.). A ravine which scoops out the western flank of this range of hills gives excellent artillery positions, defiladed from the north and east.

This is, then, the battlefield. It presents an evident advantage to the assailant. The positions of the defender are cut in two by the Meuse. It constitutes in itself only a water-course about 50 meters wide. But it winds in a major bed, walled in, about a kilometer wide, occupied by meadows which it overflows in winter. The presence of such a considerable cut, perpendicular to the defenders' front, is a grave drawback to the latter. Military history furnishes a celebrated example. In 1813, Napoleon owed the victory of Dresden to a ravine similarly placed in the Austrian positions.

The alternating of ravines and plateaux, on the contrary, presents great advantages to the defense. The assailant must go forward, either across open spaces deluged by the adversary's fire, or in narrow passages swept by enfilade fire. As soon as the attack takes a step, it falls under a new fire. Woods, here and there, are citadels difficult to force. But, inversely, those woods on the periphery constitute good positions of assembly and departure; those in the defenders' lines, once occupied by the assailant, serve him as cover for the launching of new attacks. Such has been on the left bank the rôle of the Corbeaux woods. Finally, the ravines get closer together as they descend towards the Meuse; they constitute roads prepared for those converging attacks, which, since Field-Marshal von Moltke, are the beginning and end of German tactics.

Add the nature of the terrain, this soil of Jurassic limestone, compact and fissured, which absorbs water, remains dry and makes no mud. There is, crossing all France from Metz to Poitiers, a sort of wide sidewalk paved with this terrain, without forests, with few water-courses, a highway which, from the time when Gaul was an impenetrable tangle of forests and marshes, offered already a clear route for man's commerce. At Verdun it is the ancient commercial route of Gaul which has furnished the Germans, in the midst of winter, a solid terrain, where they were not afraid of bogging down, as in the mud of Woëvre and Champagne.

It is said that Verdun exercised a powerful attraction for the German imagination. During all the Middle Ages it was a frontier city, Germany beginning on the right bank of the Meuse, France on the left bank. It passed to France when Henry II took possession of the Three Bishoprics. This king thought at once of fortifying it. This project was realized by Henry IV following the system of the foremost engineer of the time, Errard de Bar-le-Duc. Vauban remade in 1682 the fortifications of Errard. In 1792 the Prussian army forced the line of the Meuse at Verdun. In 1870, Verdun, placed exactly at the crossing of the Meuse and the routes from Metz to

Paris, embarrassed considerably, till Nov 9, the communications of the German armies operating from the Loire to the Somme. At the beginning of this battle of Feb, 1916, German newspapers were filled with historical articles about the city, claiming the city as German by treaty. Beyond a doubt, moreover, the forcing of Verdun was represented to the soldiers as the first step on the road to Paris.

#### IV

The articles inspired by the German General Staff have varied a great deal as to the importance of the action before Verdun. While an order of the Crown Prince to the II Corps, on Mar 4, represented that city as the heart of France, while an order of General von Deimling to the XV Corps announced the battle as the last great battle of the war—the newspapers, in order not to excite hopes at first and disappointments later, strove to diminish the importance of the end and of the means. According to them, it was only a question of disengaging Etain and the railroad from Verdun to Metz.

In reality, if one wishes to understand the facts, he must represent to himself an action executed with the maximum of means for the maximum of effect. One would form a very false idea if he imagined that the object of the German attack was simply to take a citadel. The fortified region of Verdun, between the French army operating in Argonne and the army operating to the north of Toul, formed a distinct zone, defended by a particular army, fitted in between the two others. The object of the Germans was to overwhelm that army and to ruin thus an angle pillar of our front.

In 1792, the attack of Verdun had been made on the north and east. In 1870, on the contrary, the Germans had passed the Meuse at Charny, above the city, and they had attacked Verdun from the west. The Crown Prince could then follow either example. It is not doubtful that he wished, this time, to execute a frontal attack on the right bank by the north and west, a rupture by main force. With this frontal rupture was to be combined a flank attack which would be started later on the east front. Broken at the head and turned in flank, the French corps would be thrown in disorder on the Meuse, to pass it from east to west. But at this moment the German corps of the left bank, going forward in their turn, would bar their retreat and would consummate their ruin.

The north and northeast regions were doubtless chosen as being the most accessible.

One last reason which may have determined the Germans to attack in the sector of Verdun: This fortified place could only be supplied, except by highway, by two railroads: one to the southwest is the great line from Verdun to Reims by Sainte-Menehould; it passes under the fire of the enemy and has, in fact, been cut; the other, to the south, is narrow gauge. The French staff did everything possible to increase the capacity of this railroad, and finally brought it to a point where it could supply 10 army corps. Moreover, the

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automobile traffic was developed a great deal.

It is none the less certain that the Germans had the advantage of 14 railroads, and that advantage was able to counterbalance, in their thought, the strength of the Verdun position. We may be sure that they weighed that strength exactly. But it is in the German doctrines of war, inspired in that by Napoleonic maxims, not to dread to attack the adversary at his strong point; it is thus only that great results are obtained. The way to conquer is to take the bull by the horns.

**V**

The first thing for the Germans to do was to prepare a fresh mass of shock. They fixed it at 4 army corps, each formed of 2 divisions of 3 regiments. If the division is estimated at 10,000 men, the total is 80,000 infantry. It is probable that this estimate is a little below the actual number.

The battle mass had to be taken from armies already existing; and since the density on the Russian front has, for a long time, been reduced to a minimum, the units had to be taken from the French front. The German General Staff took the XV Corps from the 4th Army, which fights from the sea to Ypres; the XVIII Corps, which had belonged a long time to the 1st Army, fighting on the Oise, and had later belonged to the 3d Army, and appears to have then taken part in the Serbian campaign, but behind the Austrians and without being engaged.

All these corps were put at complete rest, far from the noise of cannon and specially trained for a period of 4 months. At the same time, the Germans sent for the heavy artillery of the Serbian front and a part of that on the Russian front. These preparations suppose several months' work. It must be considered, then, that the idea of the Verdun battle followed pretty closely the end of the French Champagne offensive.

On his side, the French commander was not ignorant of what was going forward. It was known that a great concentration of troops was being made in the region Damvillers, Ville, Azanne, and Gremilly, and that powerful artillery was being massed in the Gremilly wood. Six French divisions of infantry, six regiments of heavy artillery drawn by horses and tractors, finally some heavy artillery of great power and some mounted on railroad trucks, were sent as reinforcements to the region of Verdun between the 11th and the 16th of Feb. On the 20th of Feb, a new division was assigned to the region, and 2 army corps were started towards Bar-le-Duc and Revigny.

Moreover, about the 20th of Jan, the chief of the General Staff had come to visit the region. What were then our first line positions?

They had been determined, at the end of 1914, by a series of combats in which we had made sensible progress to the north of Verdun. On Oct 15 we had taken the village of Brabant and the Haumont wood. On Dec 21,

pushing forward between these two points, we had carried the southeast corner of the Consenvoye wood.

But, while our center was advancing thus, our wings had come in contact with extremely strong obstacles. On our left, on the west bank of the Meuse, there rose before us a long ridge extending east and west, 300 meters in elevation at the west, toward Cuisy, and 272 meters at the east, towards the Meuse. It terminated there in a wooded promontory called the Forges wood. This promontory is split by a ravine constituting an excellent artillery position, and is approached only by bare glacis. During the winter of 1914-1915, the 15th French corps had tried in vain to approach it.

The French right wing had also found in front of it a very strong observatory, composed of two heights called the twins of Ornes, which our troops had vainly tried to capture at the end of 1914. Thus the two flanks of the French line to the north of Verdun were compressed by two strong German positions, which obliged it to bend back its right and left, while the center curved like a watch-glass before the Bois d'Haucourt and the Bois des Caures.

This disposition in the arc of a circle was naturally exposed to converging fire from 3 directions: from the Bois des Forges, on the west; from the Bois de Consenvoye, on the north; and from the Bois de Gremilly, at the east. It is very evident that such an exposed position had to be only a front line, which could not be held before an attack pushed home.

A second position had then been prescribed by the chief of the General Staff; the left marked by Samogneux, Hill 344, Mormont farm, the center, by Beaumont-la Wavrille—les Fosses—Bois des Cauières.

The right, in the Meèvre plain, had been determined by the combats of the spring of 1915; it extended from Mogerille to Proméze. The second position extended from Bezonvaux to Dieppe.

A third position was constituted by the line of the forts and defined by the village of Bras, Douaumont, Haudaumont, Fort Vaux, La Laufée, and Eix. Between the 2d and 3d positions, from the Meuse to Douaumont, rises a line of hills which are, from left to right, the Côte de Talou, the Côte du Poivre, Hill 378; an intermediate line of defense had been sketched on the reverse slope of these heights; that is, on the south slopes. It is known that the organization of reverse slopes, used by the English in the wars of the first empire, advocated in France, in 1902, by General Piarron de Mondésir, had been used efficaciously in Champagne by the Germans for their second position.

**VI**

The bombardment commenced on the morning of Feb 21. It was a formidable avalanche of shells of all calibers, from the 420 mm. to the 210, including the 380 and the 305 Austrian. Artillery of smaller caliber than 310 did not participate in the preparation. Aviators gave

up indicating on the maps the batteries which they saw in action in the little wood of Gremilly; it seemed to be literally stuffed with cannon.

At 4 o'clock in the afternoon, the fire redoubled in intensity. At 5 o'clock, the first German infantry attack was launched against our center, on the Bois d'Haumont and the Bois des Caures. The battle was on. It is the moment to define the particular tactics that the Germans used in it.

In Napoleon's time, tactics changed every ten years. They change to-day every three months. Those which were followed in Champagne, on Sept 25, were based on the experience of the battle of Artois of the 9th of May. The Germans profited by the experience of the battle of Champagne, and this is the system they adopted.

Their point of departure was the idea that men cannot be made to fight against matériel. Consequently, they put much care into their artillery preparation, choosing a restricted objective, a front of 500 meters, for example, which they shelled in a methodical manner until they had transformed it into ploughed ground.

It is remarkable that they dug many fewer communication trenches than we had done. They did not establish any parallels of departure. It was the first-line trench which served them as a starting-point, the troops huddling in deep shelters dug there, and protected by a covering mass. When one of our shells fell into one of these agglomerations of soldiers, it caused ravages there. They did not try, either, to push these trenches to within assaulting distance. In certain sectors, for example, before Herbebois, they attacked at the distance, almost incredible in this war, of 1100 meters.

The assaults were executed on precise objectives, demolished by the artillery. To assure themselves of the crushing of our lines, a reconnoitering party, led by an officer, would go forward, usually about 15 men strong, but sometimes made up of as many as 60; next would come a line of pioneers and grenadiers, then the first wave of assault. The waves would follow one another at about 100 meters' distance. If the infantry met an undestroyed obstacle it was to stop, and the artillery preparation would begin again. If, on the contrary, the leveling of the position had been such that defense was impossible, the infantry took possession of the ground, intrenched themselves there and pushed no further forward. It was, in short, the artillery which conquered and the infantry which occupied. They thought, by this procedure, to advance with very few losses.

But the fact is that our infantry held. Under this hell of fire, it is very evident that the defender must shelter himself, cling where he can, most often fall back. There comes the moment when the assailant hurls forward his infantry. He is then obliged to lengthen the fire of his artillery, which ceases to be a fire of demolition to become a curtain of fire. It becomes then more dispersed and is almost

never absolutely impenetrable. A determined infantry comes back and resumes its positions through this curtain of fire. It loses men, but it passes, and when the assailant arrives in his turn before the positions that he believes empty, the defender receives him with machine guns.

The first shock was given by the three corps placed on the plateau, immediately east of the Meuse (the VII Reserve Corps, the XVIII and the III), on the front from Brabant to Oxnès. During this time, the XV Corps was waiting, with the purpose, no doubt, of going against the French right when victory should have been gained on the plateau, and to complete thus the frontal rupture by a flank attack.

Everything indicates that the Germans expected that this mechanism of precision would function with lightning exactitude. It is said that, before the battle, all the regimental commanders had been called to Charleville, to general headquarters, and that there, in the presence of the Emperor, on a terrain similar to that of Verdun, they had executed a real skeleton maneuver, a dress rehearsal of the battle. However that may be, never has a great military action been prepared with more method, equipped with more power, or finally started with a more astonishing mixture of circumspection and vigor.

## VII

The first infantry attack was then launched on Feb 21, a cold winter day, at 5 o'clock in the afternoon, on the front of Haumont-Bois des Caures-Herbebois. The Haumont wood, in spite of the glacis which surround it and which favored the defense, was taken in 3 hours. The Bois des Caures was likewise lost by us, but its southern part was retaken. At Herbebois, the enemy, master of the first-line trenches, was stopped on the supporting positions.

At the end of the second day, the 22d, we held from left to right Brabant, Lamogneux, Mormont Farm; we are still holding the southern part of the Bois des Caures, la Waville and Herbebois. In other words, our line has been bent back with the right as a pivot. Our left, on the contrary, has fallen back more than 4 kilometers.

The outlook was better on the 23d. Of course, on the left the enemy kept Samogneux under a hellish fire, which forbade us even to counterattack. But, in the center we held firmly on both sides of Beaumont, the head of an important ravine. On the right, at l'Herbebois, the enemy attacked from 11 o'clock in the morning till 4 o'clock in the evening without gaining a foothold there.

We have a picturesque story of these combats of l'Herbebois. The north edge of the wood is a dense thicket, about 500 meters deep, with big trees here and there. In rear, the thicket cleared up and changed into a grove; but this grove was itself transformed into abatis by the German shells. It was necessary to crawl under the snow in a confusion of felled trees, erect palisades and organize the shell holes. On the 21st, the Germans seized

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the first line, if that name can be given to upset furrows and a lunar landscape of shell holes. On the 22d, counterattacks were made by the French supporting elements. The day was undecided. That night, a horrible bombardment by the Germans; but when they attacked, a bombardment by the French prevented the infantry from advancing. On the 23d, after a new deluge, the enemy attacked with very great forces on the front of a company; it is said that he had the strength of a battalion. The French waited until the attack got within 50 meters, and then knocked it down with volley fire by sections. It was a massacre. Behind the Germans a sheet of 75 shells fell in a curtain and forbade the return. The attack was overwhelmed. However, the Germans launched four other attacks which met the same fate. The obstinacy was equal on both sides. They tell of four French grenadiers who, in the communicating trench leading from the old firing-trench, occupied by the Germans to the supporting trench still held by us, brought down with bombs the enemy groups that presented themselves, during more than 20 hours. Everywhere the men maneuvered as at drill. In the infantry combats they almost always had the upper hand.

But the seizure of la Wavrille compelled the evacuation of l'Herbebois. At first the enraged soldiers refused to obey the order to retire and wanted to get killed on the spot. But, in the night, the retirement was effected.

Thus, on the morning of the 24th, the French line had been bent into a convex arc. The center still held Anglemont and Beaumont, but the two wings were retired, the left on this side of Samogneux, the right in the Bois des Fosses and la Chaume.

The day of the 24th was the worst. After enormous losses, the enemy succeeded in enveloping hill 344, south of Samogneux, and in taking it in reverse, Beaumont and the Bois des Fosses were likewise turned and, on our right, the Bois de la Chaume was taken. Finally, at our extreme right, the village of Ornes, which was a part of the first line and which held till then, now surrounded on three sides, had to be evacuated.

Thus, in the night of the 24th-25th, our left was back as far as Bras, our right on the plateau towards its culminating and decisive point occupied by the Fort of Douaumont. Between these two points, separated only by an interval of less than five kilometers, our front was developed in a convex arc through the Côte de Poivre, the village of Louvemont. Hill 378, the Bois de la Vauche. This position was like the edge of a funnel of ravines, which constituted the interior of our lines and which descended to the Meuse.

The situation was so grave that the general commanding the center group, uncertain as to whether the right bank troops could hold, gave to the troops more to the east in Woëvre the order to fall back on the Hauts-de-Meuse.

At this news, General Joffre constituted a new army from the troops then on the left bank of the Meuse and those which were

about to arrive. The mission of this new army was to extricate the troops engaged on the right bank if they had to fall back and, in any case, to prevent the enemy's passage of the Meuse.

The chief of the general staff had come to confer with the general commanding the center armies on the 24th. The moment was four days, had been obliged to yield ground, but they had not been submerged. Now the certainly grave, but not desperate. The first line divisions, which had been fighting for first supports arrived.

Moreover, the enemy, who had advanced in front of our left more than 7 kilometers, was obliged to move his artillery. There was then time on the 25th to organize the combat positions on the right bank, and to send over there new divisions. In these conditions, there was no longer any doubt as to what to do. After having wisely provided for the worst, the French commanding general could look to better things. The right bank could be held. The order was given to hold at any cost. Finally, in the evening, General Pétain took command of the troops in the fortified region of Verdun, and of the troops on the left bank. He brought his staff with him. His sole mission was to check the enemy's effort.

**VIII**

On the 25th, the Germans made some more progress. The village of Louvemont was taken; also Bezonvaux, and elements of the III Corps penetrated the Fort of Douaumont.

That was the end of the German advance. The effects of reorganization and reinforcement began to be felt. On the morning of the 26th, five energetic counter-attacks carried the line back in front of the Douaumont fort; a little group of Brandenburgers clung to the ruins; surrounded on three sides, they succeeded in maintaining communications with the German lines.

That was the essential point. To the east, the enemy indeed succeeded in seizing the positions of Hardaumont. In the bend of the Meuse, around Champneuville, a curious condition arose. The Germans occupied the northern part, but the French held the southern part and the Côte du Talou, which dominates the rest. If the French maintained themselves in the peninsula formed by the bend, they would be surrounded on the north and east by the enemy. And, if the Germans tried to establish themselves there, they fell under the fire of French batteries situated to the west of the Meuse, in the western ravines of the Mort Homme. The region was in a way neutralized from the 27th of Feb on.

On the 26th, the German rush was broken at the principal point, in that Douaumont region which is the key of the battlefield.

However, as has been seen, Brandenburg elements remained there in an advanced position. The tactics of the enemy was to disengage them and to enlarge the position. Now, at 500 meters to the west of the fort and about ten meters lower, the French occupied the village of Douaumont. The Germans had



to take this point of support and connect it with the fort. From the 26th to the 29th they attacked with fury; then the attacks ceased; the enemy was exhausted; his situation was fixed, and the chief of the general staff, reassured, could return to the commander-in-chief. The first part of the battle was finished.

(Follows a detailed account of the German movements in this first stage, giving the positions of the different elements.)

After two days' respite, on Mar 2, the 113th division attacked the village of Douaumont. From 10 o'clock in the morning till 3 o'clock in the afternoon shells rained on the village. The German infantry believed the position cleared; it advanced from two directions: from the north, by a ravine, and from the east coming down from the fort. The Germans coming from the latter direction wore French helmets. The attack was received by a machine-gun fire that mowed it down. The enemy began artillery preparation again, and this time he occupied the village; a French battalion, which was defending it, fought heroically; on the left, the 10th company, submerged by German masses, and feeling itself lost, rushed on them with butt and bayonet and returned to the charge to the last man. Tho they took the village, the Germans could not advance any farther south, and on the 3d the French heavy artillery opened on the village. At nightfall, two French battalions retook the village. But, on the 4th, after 5 hours' combat, the heap of ruins that was the village fell again into German hands. The French established themselves 200 meters south and the enemy could not take another step.

The taking of Douaumont cost the Germans heavily; in front of a single French trench, after a German counter-attack on the evening of the 3d, 800 bodies were counted. The French troops behaved heroically. A soldier, wounded at the beginning of an attack, refused to be attended and cleaned his comrades' rifles. Another, attacked by five Germans, killed two of them with the bayonet and shot down the other three as they fled.

### IX

The combat of the 2d had finished the ruin of the XVIII Corps. Thus, of the three corps which had delivered the attack, two were completely *hors du combat*, and the end was not attained. It is true that the French had lost their first two lines, but they had opposed an invincible resistance on the third. The ruin of the German mass of shock, before it had fulfilled its mission, might be regarded by Germany as a disaster. Now, the army of the Crown Prince was still intact. They decided that it should attack in its turn.

Thus the battle was to develop in the order first established: after the attack on the center, the wing attacks. Only these attacks, instead of being made after the success of the central attack, were to be made after its check.

On the west of the Meuse, the French positions comprised a front line formed by the villages which border the Gorges brook, that is to say, from west to east, Malancourt, Béthincourt, and Forges; to the west of Malancourt, the line curved southwest to Avocourt.

The second line was defined by the front—Avocourt, Hill 304, Mort Homme, Cumières. In rear is a third position, separated from the first by a line of ravines where the assailant would undergo frightful losses; it is formed by a concave arc of hills—Montzéville, Bois Bourrus, and Fort Marre.

On the 6th, two divisions attacked the right of our line, which was difficult to hold on account of the bend of the Meuse referred to above. Having taken Forges and Regnéville, the enemy found ravines which led him in the direction of our principal position of the Mort Homme. One of these especially favored the attack, the ravine of the Bois des Corbeaux. The Germans finally took this wood on Mar 10.

The Germans could now neglect the rest of our front line and concentrate their efforts on the Mort Homme, which is on the road from Béthincourt to Cumières.

On Mar 14, they carried Hill 265, the north-west hill of the two forming the range called Le Mort Homme, but failed before Hill 295, which has the command and which constitutes the key of the position.

They tried then to take our left bank line by the other end and to carry Hill 304. With this purpose in view, they attacked the Bois d'Avocourt with liquid fire and took it, but when they wished to debouch towards Hill 304 they came under a cross-fire and had to give it up. The division attacking lost, it is estimated by Colonel Feyler of the Swiss Army, from 50 to 60 per cent. of its strength between Mar 20 and 22. After 14 days' effort, the wing battle, to the west of the Meuse, was lost.

That on the east met the same fate. The attack was not simultaneous along this whole front. It began on the 8th along the front from Douaumont to the spur of Hardaumont, at the north of the Vaux ravine. Beyond the taking of a work at Hardaumont, this attack failed. The III Corps, which participated, was taken to the rear for good; it had lost 22,000 men since Feb 21.

On Mar 9, troops attacking the Côte du Poivre were repulsed, and others made useless sacrifices in the region of crests and ravines separating that hill from Douaumont.

Farther east, they attacked Vaux and Fort Vaux, in an attempt to take our center in reverse. A regiment, advancing to the attack and the first battalion came on in column of fours without patrols or advance guard. The of Vaux, believed the village to be abandoned, leading company entered the village, was received by machine-gun fire, charged with the bayonet, and exterminated by grenades in the houses where the men took refuge. The only result of the attacks in this section was the

**VERDUN, Battle of—Continued**

taking of the eastern part of the village of Vaux and the spur of Hardaumont.

Their accounts declare that, from this moment, the front is stabilized on the right bank, and that the war of positions has been resumed. Thus, to the east of the Meuse also, the wing battle had failed.

The next effort of the Germans was to reduce what remained of our front line from Malancourt to Béthincourt; this from Mar 30 to Apr 8. On the 9th the Crown Prince delivered a general attack from Avocourt to the Meuse, which resulted in a bloody check.

An attack was launched on Mar 31 on the right bank. There is almost always correlation between the combats of the two banks, the aim of the enemy being to divide and weaken our reserves. They took the west part of Vaux and on Apr 2 the Bois de la Caillette, on the north flank of the Vaux ravine. But, on the 3d, energetic French counter-attacks retook all their positions and re-established the front as it had been in March. Moreover, the French inaugurated a system of counter-attacks, local but very energetic, and began the methodical recapture of the terrain. They advanced thus to the north of the Caillette wood and to the south of Douaumont. On Apr 20, they extended this system to the left bank and enlarged their positions in front of the Mort Homme.

The Germans, before this progress, have tried to react. There have been three of these efforts, which are of a defensive-offensive character. On Apr 11, they attacked between Douaumont and Vaux; Apr 17, between the Meuse and Douaumont; and, Apr 19, they sought a distant diversion towards Les Eparges. None of the attempts has given any result.

**X**

Let us sum up the lesson and the characteristics of this long battle.

Germany, whether she wished to forestall an allied offensive or whether she needed a prompt decision, prepared from October to February for an action of the first magnitude. She put into this action at first six and successively as many as thirty divisions. Admitting that she did not wish to give the battle capital importance at the beginning, it is evident that the battle has assumed that character.

If the battle is considered in space, the Germans had obtained the following results after two months of struggle. On the right bank of the Meuse they had arrived in our right sector at the line of the permanent defenses of the fortress; they had even nicked this line at Douaumont. In the left sector, they were contained on a semi-circular front about the Bras ravine. On the left bank, they had reduced all the front line on the Forges brook; on the principal line, composed of two symmetrical positions, the Mort Homme and Hill 304, they had approached the former without being able to seize it; they had never been able to attack Hill 304 directly.

Considering the battle in time, the German progress is divided into four phases: on the right bank, almost all the gain was made from Feb 21 to 26; it measures in places a depth of seven kilometers. Since that time, the Germans have gained only two narrow bits of ground—the village of Douaumont and half the village of Vaux. On the left bank, the gain was made in two great phases: from Mar 6 to 10, the Germans took the right part of our front line, and, as an epilog. Hill 265 on Mar 14. From Mar 30 to Apr 8, they took the left part of our front line, and on Apr 9 they delivered the general assault which was disastrous for them.

Thus, on the right bank, the progress of the enemy was totally stopped on Feb 26, or on Mar 8, at the latest; for six weeks his attacks have been breaking against a wall. On the left bank, the battle commenced fifteen days later; the front line, almost necessarily sacrificed, held much longer than on the right bank; these various reasons prolonged the German advance till Apr 8. But then it, too, broke on a wall. Moreover, since Apr 4 on the right bank, since Apr 20 on the left bank, the French have passed to the counter-offensive.

To conquer is, following the classic formula, to impose one's will on the enemy. The Germans wished to break the French front, and they have failed; the French wished to wage a defensive battle, that is to say, to inflict on the enemy the maximum of wear until the balance tipped, when they would take the offensive. They have achieved that result. The Germans have engaged, used up, renewed, used up again, greater and greater forces. They have gotten their 1916 class massacred, they have thinned the rest of the front, they have engaged all their resources in a desperate effort. The Germans have fought the battle of Verdun because, in a struggle of attrition, they would necessarily be inferior, and because the knot had to be severed with the sword. But this time the sword broke. They are in a worse situation than before Feb 21. Caught as in a net, the more they struggle to free themselves the more firmly they are held. Their effort has exhausted them and increased the inequality. The Battle of Verdun is the first act of decisive victory.

[The Battle of Verdun is Won. Mesopotamia. By Hilaire Belloc. *Land and Water*, May 4, '16. 4800 words. 2 sketches.]

The greatest battle ever fought has been won by the French upon the sector of Verdun. Verdun means to the enemy a loss over and above the loss he has inflicted upon his opponent of between four and five army corps. This battle can go down to history as a colossal example of error in strategical judgment.

(The discussion of Mesopotamia will be found under that heading in its proper place.—Ed.)

[Explaining the Lulls in the Battle. By E. Charles Vivian. *The Canadian Military Gazette*, Apr 11, '16. 1300 words.]

The division of the battle of Verdun into phases is the result of certain necessities imposed on the enemy and not, as some think, an arbitrary division made by those who are closely following the battle.

The first phase lasted until Friday, Apr 3, when the first lull occurred. This lull was brought about by the fact that the Germans had consumed all of their ammunition and more had to be brought up.

The second phase consisted in an attempt to storm the Louvemont ridge, the French main position, and when the fresh supply of German shells gave out a second lull naturally resulted.

It is reliably estimated that in each of these first two phases literally millions of shells were expended by the Germans, and this, too, without touching the supply reserved for use against Russia.

The third phase of the battle then opened with a German attempt to drive back the French along the western bank of the Meuse, and this attack followed exactly the lines of the attack on the east with which the battle opened.

[The Last Attack at Verdun. By Hilaire Belloc. *Land and Water*, May 11, '16. 4700 words. One sketch.]

The Mort Homme is the critical point of Verdun. If the enemy fails to take Mort Homme he may render it untenable by taking Hill 304. The latter is a flat-topped eminence, 50 feet higher and about 2000 yards to the west. The sector, Mort Homme-Hill 304, has been an objective upon the west of the Meuse ever since the middle of March.

On May 3, the enemy made a new intensive bombardment of this sector. For two days he bombarded the northern slopes which fall upon Avocourt Wood, the northern slopes of Hill 304, and the valley between the Mort Homme and Hill 304. On May 5, he launched about one division along the valley between the two hills and made repeated efforts to pierce the line and to carry Hill 304. This attack was a failure. The bombardment was resumed on the night of the 5th and continued until May 7. On this date the enemy attacked the sector with a force estimated at about two divisions. The bombardment had reduced all the trenches on the north slope of Hill 304 to chaos, and the French evacuated them before nightfall. Renewed action on May 8 led to no further result here. The French held, and still hold, the summit of the hill. The total result of this offensive is that the French line, which ran originally about half-way down along the northern slopes, now runs along he crest.

In analyzing the very general and imperfect statements furnished about this attack, the following points are noted:

- (1) An attack in considerable strength has been delivered after a lull of a fortnight.
- (2) It has been delivered a full month after the last great effort.
- (3) It has been delivered with those troops which the enemy counts the best, i. e., the Pomeranian and other Prussian regiments.

(4) It has achieved exactly what has been achieved in the past at the same ratio of very heavy expense to very slight and tactically insignificant advances.

(5) The one point tactically significant to the French, the ravine between the two hills, was recovered by the defense at the expense of a successful tho no doubt locally expensive counter-attack.

(6) Most important of all, there is no evidence of the enemy's having moved his heavy artillery.

It is perfectly clear from these six points that the enemy was doing no more than continuing an attack which he knew to be, in a military sense, already a failure. Opinion is divided as to whether he can find the resources for one more great offensive before he reluctantly determines upon a concentration of strength and the admitted entry into the last phase of the war.

[Story of a Brandenburg Army Corps. By Hilaire Belloc. *Land and Water*, June 1, '16. Quoted in full.]

I propose this week to lay before my readers, by way of an object-lesson to guide our judgment with regard to the Battle of Verdun, the story now available in some detail of one single German corps; of how it was selected and trained for the attack; how it suffered beyond anything its command had thought possible; how it was incapable of further effort after one week of such losses; how it was recruited; how one more attempt was made to use it; taken to the rear, rested; and how in two days that effort broke down, and the corps disappeared for good.

I think that the matter (which I have not seen dealt with at all in any English publication) will be illuminating, and, for many of those watching the present phase of the campaign, conclusive.

The 3d Army Corps of the Prussian service is composed of Metropolitan and typically Prussian troops. It is recruited from the Province of Brandenburg. It has reputation in that service second only perhaps to the reputation of the Imperial Guard.

It was present, under the command of von Kluck, in the attempted enveloping movement by the 1st Army, which ended so disastrously in the neighborhood of Paris, and the failure of which determined the Battle of Marne. It was present in the Battle of the Ourcq when the French General Maunoury surprised von Kluck and was himself so nearly counter-enveloped.

It stood some days later upon the lines of the Aisne when the Germans dug themselves in. That was in Sept, 1914. For nearly a year the 3d Brandenburg Corps remained there facing first the British, later the French, upon the limestone heights of the Soissonnais.

The hurried concentration of German troops to meet the great French offensive in Champagne last September called down to that region certain elements of the 3d German Army Corps. But later, with the month of October, it began a series of adventures which it is of the highest interest for us to follow, because

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they show how thoroly and from what long date the attack on the Verdun sector was planned, what the attack was intended to do, and at what a cost it has failed.

Four months before the first shells of the great bombardment were delivered against the Verdun lines, the body of infantry which was to deliver the shock was already carefully selected and prepared. The method is familiar from half a dozen great examples in this war. A hammerhead of picked troops, separate from the rest, are collected and hurled at one point to deliver the hammerblow that shall break the opposing defensive cordon. The main difference between the preparation of Verdun and the other actions of the war was the greater expense in time and in men which were contemplated. It was as tho the Germans had said to themselves, after the attempt to envelop the Russian armies had failed, "We will stand or fall by one last great offensive against the western front!" At any rate, this picked corps of typically Prussian troops, the corps from Brandenburg, was chosen with others to form part of this great new agglomeration that was to strike the decisive blow. The first part of their preparation for this task was to take them away from the fighting line, to train and even feed them specially for a long period; to refresh them physically and morally in every way and produce by a patient attention to every detail and ample expense of time the very maximum effort when they should come to be launched against the French.

Like the rest of those chosen for this great task, the Brandenburgers of the 3d Corps were taken to the interior just when the exhaustion of the imperfect effort against Russia was apparent—that is, in the last third of Oct, 1915.\*

For nearly four months the special training, the repose, the special feeding even of this corps and its fellows, proceeded far from the fighting.

At last, upon Feb 8, it arrived upon the scene where it was to undertake the work to which all this preparation had been designed.

The 3d Brandenburg Corps stood on Feb 8 billeted in the country behind the hills of Ornes, that is, in Gremilly, Azannes, Ville, and to the north of those villages. It formed the extreme eastern or left wing of the great body which was to be launched a few days later against the French lines to the north of Verdun, and on the 21st of Feb it took the shock.

Let us review its strength and situation upon that day, Monday the 21st of Feb, the opening day of the infantry work before Verdun. Only so can we understand what followed.

The 3d Corps had been given the task of driving the French covering lines in on a front

of not quite two miles. Its strength in infantry actually present and designed to take part in the shock itself was no longer the full complement of 24,000 bayonets, but in the neighborhood of 20,000. These 20,000 consisted in two divisions of about 10,000 each. These divisions were numbered the 5th Division and the 6th Division. We know a good part of the composition of these divisions. They were formed of three regiments each, or the equivalent of three regiments, and we are acquainted with the numbers of four of these and a portion of the 5th. The 6th Division, that on the extreme end of the line to the east or left, was composed of the 24th and 64th regiments, and of a body of Jaegers, while the 5th Division contained the 52d regiment and the 12th regiment with a third element, the details of which I have not seen published. These divisions were not fully deployed. The elements of each stood one behind the other in support, one regiment being destined to take the first brunt of the shock; its fellows would replace or reinforce it later, according to the punishment it might have received.

In the mid-afternoon of Feb 21, a cold and misty day, the advance portions of the 5th and 6th Divisions struck the French covering line after that line had been turned upside down by the previous intensive bombardment. The main region upon which the shock was delivered here on the east or left of the German attack was the wood of Herbebois, a wood recently cut, and full, therefore, of comparatively large clearings with underwood grown up during the last year or two. The French obstacles here were very thoroly organized, and the attack of the 3d Army Corps was checked with heavy initial loss.

On the next day, Tuesday, Feb 22, the attacks were continued in a flurry of snow and failed to secure an advance. They were further continued along during the morning of Wednesday the 23d. But in the afternoon the success of German troops further to the west pushing in the center of the French covering line compelled the retirement of the French here on the east, and from 4 p. m. onwards the French retreated before the advance of the 3d Brandenburg Corps into and beyond the wood of Herbebois, and during the following night fell back once more.

During Thursday, the 24th, and all the succeeding night, the French further retired upon Bezonvaux village and the wood of La Vauche, so that by the dawn of day, upon Friday, the 25th, the whole French line was only just in front of their main position. the ridge of Douaumont, continued in a half-circle to the Hill of Poivre, and so to the Meuse at Bras. Upon the morning of Friday, the 25th, the 3d Brandenburg Corps, which had thus been held up at a considerable expense in men for nearly three days at the wood of Herbebois, but had in the succeeding two days advanced over nearly two miles of ground, delivered an attack violent in proportion to the critical nature of the moment. As they were the best troops the Prussians were em-

\*It is possible that certain elements of the 3d Corps were present not in the fighting, but in reserve during the Serbian expedition; but the point is not certain. At any rate, the great bulk of the corps was at rest at that moment.

ploying for this great shock, so they had the chief task allotted to them.

The 5th Division on the west or right was checked, but the 6th Division mastered the ravine of La Vauche and acquired, tho with very heavy loss, the summit of the ridge. The 24th Regiment rushed the ruins of the old fort of Douaumont, and we had the famous message upon which so much discussion has turned.

This Friday evening was the hour in which the enemy believed that he had achieved his purpose; the decisive point was the ridge and fort of Douaumont, and he had laid hands upon it. Heavy as had been the price already paid, it seemed as tho the rest would be the mere pursuit of a broken enemy.

But the French had been fighting with a covering line only, and upon the next day, Saturday the 26th, they launched a body as large in numbers as the whole German 3d Corps, to wit, the French 20th Corps; they swarmed back over the level of the Douaumont plateau and recovered the ground on either side of the ruins of the fort, tho not those ruins themselves. In these the remnants of the 24th regiment remained entrenched and defied all efforts to dislodge them.

In order to clear the situation and to relieve the men in the fort from their perilous outlying position, as also in order to push further on to the plateau, and make themselves really masters of it, the two divisions of the 3d Corps were ordered to strike again to the west and the east of the fort. Upon the west was the village of Douaumont; upon the east the wood of La Caillette. It was therefore the 5th or right Division which attacked the village; the 6th or left Division which attacked the wood. Upon Sunday, the 27th of Feb, the 52d regiment of the 5th Division threw itself against the French entrenched in Douaumont village and was broken. On the next day, the 28th, its place was taken by the 12th regiment, which met with the same fate. Meanwhile, against Caillette Wood the 64th regiment of the 6th Division and the Jaegers hurled themselves six times upon the French lines in these same two days and were broken back as their comrades of the 5th Division had been against the village.

On Tuesday, Feb 29th, the 3d Army Corps was exhausted in energy and broken. It was past any further effort and was called back to the rear.

The great mass designed for victorious shock, of which it had formed one portion, had failed in its task and had suffered so heavily that it was for the moment ruined. Its place had to be taken by reserves. The defense of this sector of a mile or so from Douaumont village to the Caillette Wood was, as a fact, taken over by the 113th Division. The two divisions of the 3d Corps, the 5th and the 6th, or what was left of them, were withdrawn to positions right back again behind Ornes, to be reformed after their terrible experience.

#### ACTUAL LOSSES

But all these terms, "heavy losses," "terrible experience," and the rest, are general. The reader will demand, if he is to form a judgment upon even this detail of the war, the proportion of losses.

From information unusually detailed which the French authorities obtained later on that question can be answered, and the answer is startling.

The patching together again of the 3d Corps and the replenishing of its enormous gaps with new human material showed a necessity of replacing the cadres (that is, the officers and non-commissioned officers who are the framework of any military body) to the extent of *two-thirds*. Of three regimental officers and sergeants who had gone into action exactly a week before, on the afternoon of Monday, the 21st of Feb, two had been hit by the evening of Monday the 28th. The corps had no reserves left. Every one of its elements had been thrown in and shattered. The Jaegers, who had been most spared, received their worst punishment in the Caillette Wood in the last days. The 64th regiment of the 6th Division saw its last units shattered in the same place. The 24th regiment had spent itself in the tremendous attack which had carried Douaumont Fort, while of the 5th Division, the 52d regiment, as we have seen, had been shattered in front of Douaumont village two days before the end; the remnants of the 12th taking its place had been broken upon the morrow.

We have no documentary evidence, I believe, of the exact losses in the rank and file, and it is wise to suppose that these were somewhat inferior to the 66 per cent. losses of the cadres. But, at any rate, they were certainly over half the effectives employed, and it is remarkable that in looking round for matériel to fill the gaps the chief remaining reservoir was only the young class '16. During the period of recruitment behind the lines these lads were poured into this crack corps in such numbers that many of the companies relied for nearly half their new strength upon the presence of such recruits.

On the fifth day of this remodeling, Saturday the 4th of Mar, a message and an order of the day of the customary rather sentimental sort (which perhaps we judge rather harshly from the ignorance everyone has of a foreign temperament) reached the 3d Corps from the Commander-in-Chief of this group of armies before Verdun, the Crown Prince of Prussia. He appealed to his "faithful Brandenburgers," condoled with them over their losses, emphasized the peculiar value of the Prussians among the Germanic combatants, and told them how he relied upon them for further and "decisive" efforts.

This piece of rhetoric is not insignificant, for it tells us something of the effect produced by the immense sacrifice already suffered and tells us even more of the hopes that were still entertained of victory.

The 3d Army Corps was reconstituted in

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the days following this appeal, as had been hoped.

It was not until the evening of Mar 7, Tuesday, that its commander reported everything ready for taking up again the dreadful business of a renewed attack.

The 3d Army Corps was reconstituted indeed, but it was no longer its old self. Less than half of the men who had been given that careful, long training of four months behind the lines remained. Only a third of the specially selected and instructed cadres, which had held it together, marched out southward again to take the field. Not only were most of its men new, but as we have seen, a very large portion of them were of the youngest type of recruit. Most significant of all, the 3d Corps, even thus reconstituted, no longer paraded anything like its old numbers. The companies had mustered just before the attack on Verdun about 200 strong. They appeared upon the roll-call of the 7th with an average lessening—in spite of the new recruitment—of 40 per cent. They were upon the average 120 strong.

The change in the constitution of the corps and in its *morale* after the business of the week before appeared at once. A new attack was launched upon Wednesday, Mar 8; the 3d Corps being given its old sector with a slight extension towards the south. It was thrown in, fully deployed from Vaux village right round to Douaumont village. It was no longer of the quality to do what its predecessors of the same name had done only a week before. The attack of the 8th failed. The attempt to renew it upon the 9th was even more disastrous. The losses (as is always the case with inferior troops that fail in an attack) were disastrously large and out of scale even with the fearful casualties of the first fighting when the 3d Corps was still composed of its original elements, and still thought itself capable of victory upon its sector of the line.

The last two days achieved the ruin of the unit.

In the night of Thursday, Mar 9, the 3d Corps was withdrawn from the action altogether and has never reappeared.\*

Here is surely a most striking piece of evidence, concrete and detailed with regard to the nature of the German losses in front of Verdun. The nature of the original attempt, its failure, its expense, are all before us in this one example because we happen to have upon it more complete evidence than upon any of the other German elements used in the battle.

Even had we not further knowledge, such evidence would be conclusive as to the nature of the German wastage here, and the wisdom

\*Since writing this, I have seen it suggested abroad (but not confirmed, and the suggestion not backed by evidence) that the body of troops which appeared in the last few days before Verdun and was made the subject of numerous executions after a failure to attack, was the partially reconstituted 3d Corps, brought back into the field after more than a month of eclipse.

of the French restriction to that mere defensive which has astonished Europe.

We know the way in which the first week of the fighting ruined a body to which the most complete preparation possible had been given at the expense of four months in time and of its absence during those four months from all use in the field.

We know that 20,000 bayonets had been massed against never more than 3000 yards, and at last against less than 2000 yards. We know what in that first week it had lost in officers and sergeants. We know the necessity it was under of recruiting from the younger classes. We know the changed temper in which it re-entered the field. We know that after a bare two days' experiment in renewed fighting it was hopelessly shattered and had to be finally withdrawn.

I repeat, did we only know this we should have an instructive and indeed decisive picture of the failure before Verdun.

But the French have obtained one last piece of evidence which clinches all the rest and which, read in connection with all the rest, is overwhelming.

The French authorities are possessed of evidence as to the losses actually suffered by the corps during those 17 days, of which only 10 were days of action.

It will be remembered that the 3d Corps had gone into action on the afternoon of Sunday, Feb 21, mustering about 20,000 bayonets. When its losses were privately established after the last and bloody defeat of Mar 9, it was discovered that the grand total, including, of course, casualties among the new recruits thrown in, as well as among the original members of the force, *was actually larger than its original total strength*; 22,000 men had been hit in that brief space of time.

It is no wonder that the corps had ceased, in any military sense, to exist.

\* \* \*

Roughly speaking, the Battle of Verdun was won upon the 9th of April. In other words, it was clear after the great attack of that day that the intention of the offensive had failed and the intention of the defensive had succeeded. For the intention of the offensive was to break the French front upon this center, while the object of the defensive was to use that intention as a means of making the enemy waste very many more in proportion to his remaining numbers than the French lost in the process.

This much being clearly settled nearly two months ago, there succeeded a phase which everyone studying the war spent a good deal of energy in discussing, but which no one could pretend at first fully to understand.

This phase has consisted in a steady persistence in attack after the French defensive had manifestly made good and after the only clear strategical purpose open to the enemy had been irretrievably lost.

This phase still continues, and there seems no particular reason why it should not continue indefinitely: that is, until the Allies make their offensive movement or until the enemy

proposes to make a new attack somewhere else—with such forces as may still remain to him.

So long as it continues the enemy loses far more men in proportion than the men in the French sector opposed to him. So long as it continues he allows the British to accumulate their man power, and so long as it continues he allows the Russians to make the fullest use of the open water in the north and of the long daylight for the pouring in of arms and ammunition.

Seeing that all the merely numerical calculations are obviously against the enemy and that the military problem regarded merely as a mechanical thing (that is, a thing upon the map estimated by the number of bayonets, guns, power of munitionment, etc., and presupposing both parties equal in moral factors) is clearly solved at Verdun already against the Germans, it follows that the German General Staff is persisting in attack for reasons other than the strictly calculable military reasons upon which one usually expects strategical action to be conducted.

I have indeed seen one, and only one, explanation modifying such a conclusion. It proceeds from the pen of a man whom all his readers have learnt to respect, who writes as a civilian and even as a professor, but whose writing has, especially in the last few weeks, deservedly attracted universal attention in Paris. If I read him aright, this critic (who may be read in the *Débats* newspaper) conceives that the enemy continues because the French command will not now let him leave off. In other words, he is in the position of which one reads so often tactically in the old battles, "He is no longer free to break off the action." He is *accroché*, "hooked on." If he ceases to attack he will be at once counter-attacked under conditions which he cannot support.

This, I think, it is suggested, explains the continued waste of men upon his side.

Much color is lent to it by the tactics the French have been pursuing during all the last seven weeks.

Roughly, what happens is this: The enemy masses a vastly superior number of men to rush some sector of the French covering line; usually he fails. Once in so many times he succeeds. He gains some acres; picks up not a few wounded men in the trenches he has rushed. He smashes up a certain number of trench mortars and machine guns. But all that at an expense quite out of proportion to the result. He pays in these attacks, say, four of his men to put one Frenchman out of action. But the French, tho not fighting for ground, but for numbers, usually reply to such a success by a counter-attack in which they recover the ground or a part of it at an expense in their own men superior to the expense of the enemy.

On the balance they are still heavily the gainers. But they would be much more heavily the gainers if they never counter-attacked at all upon a large scale. Why, then, do they deliberately sacrifice a certain fraction of their force in thus counter-attacking? The critic

whom I have quoted would seem to believe that this is done in order to "hook on" the enemy and make it impossible for him to stop his continued ruinously expensive and futile attack.

It may be so. But I believe if one could get into the mind of the German General Staff one would find that the motives of the enemy's action were mainly based upon his own initiative. I believe that he is attacking of his own will for the most part. I believe from the long lulls with which he has interrupted the action that he could still break it off altogether without disaster. And I consider that this motive of his is made up of certain ingredients the proportion between which it is difficult for us to judge, but the presence of all of which we can confidently assume.

It is certain that among the ingredients of the enemy's thesis are:

(1) The conception that the continued losses of the French, tho relatively far lighter than his own, will ultimately shake French morale.

(2) That the morale of his own army requires of the enemy the actual entry of German troops into the geographical area called Verdun, or failing that, the continued advance at no matter what cost and no matter how slowly, from one point of territory to another upon the sector of Verdun.

(3) That not only does the German army require such morale sustenance, but that the German domestic opinion also requires it.

(4) That neutral opinion would be affected particularly in countries not military but economically powerful, by the "taking" of Verdun town, and is in some degree affected by the fact that the German armies in this sector advance from point to point. For one lay civilian observer who considers the nature of the offensive and the defensive, and is acquainted with the now rapidly declining man power of Germany, there are a thousand whose estimate of success or failure is simply a movement upon the map, however slight.

I say that these ingredients in various proportions make up the German thesis; and of these it is clear that the first is by far the most important. The Germans must believe that the continued strain, no matter at what cost to themselves, is likely to exhaust French civilian endurance and military vigor. He may be quite wrong. Personally, I believe him to be quite wrong. But my point is that he is working for a moral effect of which the chief part will be experienced, he imagines, in France itself.

Upon the other side, the French thesis is what we have so often described: that so long as the enemy continues under this erroneous impression he is playing the game of the Allies.

Now, it is very important, if we are to judge the value of either thesis, to discover what the nature of the enemy's sacrifice is. With this object, I have given in detail the story of the 3d Corps, and I think the enemy's immense sacrifices may further be understood by considering the thing as a whole.

## VERDUN, Battle of—Continued

It is clear upon general principles that an offensive thus conducted will always lose very many more men than the defensive opposed to it. Each party suffers roughly the same losses from artillery pounding before movement, and the moment movement takes place the attacking party loses out of all proportion to the defense.

When movement has ceased the attacking party suffers again in one of two ways. Either he fails to enter any portion of the positions of the defense, in which case his swarm flows back, suffering terribly heavy punishment from the opponent's artillery; or he makes good, *but makes good upon a spot which the heavy guns behind his opponent's line have to a yard and immediately deluge with what the French call "crushing fire."* The offensive has not the same advantage against the defenders, because the line upon which the greater part will retire is not thus accurately known. It has to be sought out and marked down later. Against these necessarily highly superior losses of the offensive the only point against the defensive is that positions occupied by the offensive at the end of its attack may be disorganized and suffer locally some abnormal loss thru disorganization—but, then, it is the whole point of a defensive to prevent that. If that took place on any large scale the defensive would break down, and the continued and complete success of the defensive policy for months in front of Verdun proves that it has not broken down.

## THE WEEK'S EVENTS

What has been happening this week at Verdun is a mere repetition of all that we have been discussing here. It has been on rather a larger scale than usual, but it exemplifies every point precisely. You have attack after attack which does not properly leave its trenches, because it is caught in the first bound; for example, the two divisions trying to get out of the Crow's Wood last Sunday. You have the first massed attack launched against the Mort Homme, which the French estimate at about 50,000 bayonets, repelled—and leaving the very large proportion of 15,000 dead. You have the French local counter-offensive at Douaumont provoking another swarm attack, estimated at something like two divisions, say, in practice, 20,000 bayonets, or a little less, and retaking, at terrible expense, the ruins of the fort which are immediately subjected to the "crushing" fire which knows every yard of the spot. You have the heavy massing of men for the rushing of Cumières, and you will certainly have, before these lines are in print, another great massed attack to rush Cumières again with the usual quite disproportionate expense in men; the preliminary bombardment was already notified in telegrams of Tuesday.

I have not seen evidence as to the sectors from which these fresh German divisions are drawn, save the public announcement by the French that they had identified two Bavarian divisions, which had come from the English front. But if the enemy is determined to play

the French game here he can still continue so long as our defensive, which is strictly ordered upon every part of the line, gives him rope. He may still withdraw divisions from his ever-weakening line (remember that his effectives are now declining in number), to melt them away at Verdun, and he will still find that defense almost passive and unprovoked to any great countermove. It is for him to decide the date upon which such a policy will determine his inability to stand against the main counter-offensive of the Allies. At present he would seem to desire a hastening of that date, and he is the best judge of his own affairs.

[Battle of Verdun. First Phases. By P. S. *Revista Militar* (Portugal), June, '16. 4800 words.]

This is the second French version of the battle of Verdun and it was written during the first days of April. The article is accompanied by maps and illustrations as well as a photograph of General Pétain, with a brief biographical sketch.

Initiation of the attack—February 21st.

Feb 22—Attack on Brabant and Herbebois. Taking of the woods of Haumont.

Feb 23—Evacuation of Haumont. Loss of the woods of Caures.

Feb 24—Evacuation of Brabant and Beaumont.

Feb 25—Attacks on the heights of Poivre, Vauche and Douaumont.

Feb 26—The return to Douaumont. Defense of Haudromont and of Hardaumont.

Feb 27—Defense of the lines of Douaumont

Feb 28—New combats in the turning of Douaumont.

Feb 29—Attacks on the heights of Poivre; intermittent bombardment. Operations in the region of the Woevre. Attacks on Douaumont, Haudromont, Vaux and Hardaumont. The Woevre. Operations on the left bank of the Meuse. Loss of Forges; defense of the heights of Oie.

Just after this article was published the *Bulletin des Armées* published a complete account of the first phases of the battle of Verdun, and this was later published in *L'Illustration*.

[War Notes. By Captain H. M. Johnstone, R.E. (retired). *United Service Magazine*, June, '16. 400 words.]

The five contributory reasons given by the French as having influenced the German command in their choice of Verdun as the scene of the great attack are (1) the saliency of the French front at Verdun, affording opportunity for convergence of effort and for envelopment; (2) the hard ground, as contrasted with the soft clay of Champagne and the Woevre, an important tactical matter at that season; (3) the French army at Verdun being cut in two by the Meuse, which in the wet season expands in width from 150 yards to half a mile; (4) the scantiness of the French railway communication, the main line from Verdun to the west being within range



of the German heavy guns, and that up the Meuse valley to Commercy and Toul being cut by the Germans at St. Mihiel; (5) as a possibility, that the "house" of Hohenzollern wished to win laurels for the heir to the throne.

Far out in front of Verdun the false front, a device that was often thought to have some dangers in the more open warfare of earlier days, is of very great value at the present time. It enables a defender to save his men, by not having to put masses of infantry from the very beginning into the danger zone throughout all the terrific bombardment of modern warfare. The holding for a time of advanced positions takes the edge off the attackers' artillery work; even if the latter's guns, realizing that the main line is a mile or two in the rear, pound the main line as well, its infantry defenders, feeling the cover afforded by the advanced positions, can be kept safe in prepared concealments. The French have benefited enormously at Verdun in this connection, and now, recognizing the weakness of the enemy's impulsion, are busy re-creating the false front. These gains provide a sort of buffer which takes up the first shocks of hostile impact. The French command is showing great prudence in making them, for, though the enemy's aggression has for the moment slackened, he may not yet have abandoned the effort. The stories he has put out about the massing of fresh troops in western Belgium may well be a mere blind to conceal the intention of going on with the assault on General Pétain's gallant army. Count Andrassy said the German command was bent on having Verdun "at any price." They lost their case in the first court by infantry saving; they lost in the second though the masses of flesh and blood were thrown in; they may yet appeal with more masses.

[The Enemy Object at Verdun. By Hilaire Belloc. *Land and Water*, Apr 6, '16. 6800 words.]

The one question which Verdun is suggesting throughout Europe now is this: What is the German object in continuing the attack?

Upon the 19th of Feb last, after a preparation in the way of bringing up heavy pieces and accumulating heavy munitionment, resting their men, training special bodies, etc., lasting about two months, the Germans opened the attack, not upon the "Fortress of Verdun," for there is no such thing, but upon the Verdun sector of the western front.

Upon Feb 21 they launched their infantry, after the forty-eight hours' preparatory artillery work, against this eight to nine-mile front, employing no fewer than 14 divisions in this shock.

Forty-six days have already elapsed in the pursuit of a task which originally was designed for about four days.

There have been two main phases in this attack. The first shock was intended to crush back the French troops beyond the Meuse, and in the heat of that victory to break the French

line immediately beyond. This original scheme broke down altogether. The moment of its failure was the French counter attack on the plateau of Douaumont at about noon on Feb 26.

The battle of Verdun, as the Germans had designed it, was lost within the first week. All the other great offensives launched during the war, since the rôle of heavy artillery became clear, demonstrate that at this point the German attack should have ceased.

It is clear to any military student that great offensive efforts against the modern entrenched defensive are so costly in *men* and *matériel* that unless a rapid breaking of the front is accomplished (such as was effected on the Dunajec line last year), the losses in both must be reduced at once.

The Germans, having lost their battle in the first week, continued the struggle in a series of actions which tactically present a distinct and novel phase. This new phase is characterized as follows:

(1) Assaults are delivered upon narrow specially selected fronts, never more than 2000, and often only 500 yards.

(2) Each local action is prepared with a very costly bombardment, and involves the use of from one division upwards.

(3) The sectors selected for assault each have an obvious tactical value (of which the French are fully aware). There is no element of surprise. The troops broken at the first or second effort are withdrawn. New troops are sent up in turn and the action is so continued.

(4) Against this prolonged system of dense local attacks, confined to points upon a general line of 30 miles in length, the French oppose what they call *dynamic resistance*. It is not a wall, but a hot iron against which the attacking material melts away.

(5) The whole effort has become one more expensive in men for the attacking side than for the defenders, and this question of comparative expense is the capital factor in the whole matter.

The tactical method pursued by the Germans here is to create salients in the enemy line, then to attempt either to flatten out such salients or to cut them off at the neck.

The question which has puzzled all observers in this war is the German conception lying behind this prolonged action. Their immediate objective is plainly to get troops into the geographical area marked by the houses of Verdun. They continue in this effort because they believe that it will cost them less in men than the ultimate result will cost the French.

The *ultimate object* is largely political. To talk of turning the frontier fortresses is today meaningless. The eastern defense of France is not a line of fortresses, but of trenches. The enemy's judgment of the French temper may be that continued hammering, regardless of his own losses, will cause the French morale to break.

The attack on Verdun has cost the Germans not less than 270,000 men, and probably nearer 300,000. The Germans may expect to shake

**VERDUN, Battle of—Continued**

the confidence of the world by entering Verdun, or to shake the morale of the French Army by the same act.

The conclusion is that the *moral effect* of the entry into Verdun is the main German object.

[The Right Perspective. By Hilaire Belloc. *Land and Water*, Apr 13, '16. 7500 words. 4 sketches.]

A contrast is often afforded in military history between the simplicity of the purely military problems and the complex, because incomplete, fashion in which they are usually attacked. This contrast may be attributed to the influence of what is known as the "political factor" on the military operations, and it is primarily this factor which governs German activity in prolonging the attack on Verdun.

The phrase, to "take Verdun," has, in the merely military sense, no significance whatever. The whole meaning, so far as the military problem is concerned of the struggle around Verdun, is the proportion of loss suffered by either party at any stage during the attack. There is no question of breaking the French line, or of the surrender of the fortress, since there is no fortress to surrender. No army is surrounded; no mass of material and munitions even is in jeopardy. The Germans are prepared to suffer great losses to capture the ruins of this particular town because they believe that the effect of this capture upon civilian opinion—outside France—will be such as to determine an early peace in their favor. It is the duty of the Allies to treat the struggle around Verdun solely from the point of view of numbers, and to make the enemy pay the highest possible price for something which has no military value.

(Here follows a discussion of the attacks on April 10 against the line from the Meuse to Avocourt in the attempt to capture the Mort Homme and Hill 304. Three sketches are shown.)

There are two opportunities, the one direct, the other indirect, in mastering the Mort Homme. The first is by rushing the distance—about 700 yards—separating the Crow's Wood from the summit of the Mort Homme. The Germans, debouching from cover of the woods, have but a short distance to gain before reaching the lowest slopes of the Hill. Looked at from the edge of the wood, this height is a round knoll, the culminating point of which is about 100 feet above. The French trenches coming up from the forks of the roads near Béthincourt touch the lower edge of the knoll rather more than half-way from its summit to the wood. They stretch on down the hill covering the ruins of Cumières village and so to the Meuse. The second method is the indirect one of turning Mort Homme by the capture of Hill 304, a height which commands Mort Homme at a range of about 2500 yards.

A document captured from the Germans, purporting to summarize the lessons taught by previous offensive is quoted as declaring

that the French first lines could be successfully attacked at a given expense of men—after a very costly artillery preparation—but to continue from this immediately to the attack of the second line would be an error, time being required for moving the heavy artillery forward, for establishing new supply heads of heavy ammunition, and for bringing up large reserves. The captured report prescribed that in future the advance must be made by "successive stages." This plan was not followed, as there was a decisive effort to break through all at once. The German higher command used the doctrines of this report as a "second best" after the initial failure on Feb 26. The "successive stages" plan, when once reluctantly accepted, has worked irregularly and at too great an expense in time, men and material.

The line of supply for the attack on Verdun is by the new railway built from Spincourt to Montfaucon, crossing the Meuse at Dun. The railway between Conflans and Etain is directly under observation and long-range fire from the heights of the Meuse. This caused the main attacks to come from the north, north-east and northwest.

The Germans were tied to the twelve or fourteen miles over which their efforts have been directly largely by their dependence on heavy guns and howitzers. They have in use the 305 and 320 mm. howitzers, the 380 mm. naval gun, and about twelve 420 mm. howitzers. The handling of these enormous masses ties them to the railway or its proximity.

Estimates published in the British press place the attacking troops in this offensive at 450,000 men and the losses at between 150,000 and 200,000 men.

[The Land Strategy of 1916. The Lesson of Verdun. By Lieut.-Col. A. J. Richardson, p.s.c. *United Service Magazine*, May, '16. 800 words.]

Of the two possible objects of the attack on Verdun, the first is to deprive the French of ground they took much trouble to win and of which the possession is essential to their general advance, and the other is to push back the French line at this point to make it more vulnerable elsewhere. If the Germans had intended to break through the French line, they would have been on a wider front and have made assaults all along the line. The armament and entrenchments of the French at Verdun differ vastly from those of the Russians on the Donajetz in 1915, and a decisive victory is not to be gained by local attack, however fiercely pressed. When one side or the other thinks it can advance in the west, it will attack on a front from Switzerland to the North Sea, so that all the defender's troops may be pinned to the ground, and if possible his reserve got into the fight before the decisive moment and kept there; and even then exhaustion is more probable than success.

Until May, the Central Powers may try to pulverize France, or at least may so batter the French as to make them incapable of tak-

ing the offensive. The strategical plan of the Allies seems to be to take the offensive on the western front this spring. Though it is unlikely that they can break through the German line they can probably pin to their western trenches some 4 or 5 men per yard, say in round numbers, 4,000,000 men, and thus relieve the Russians. The French strength is estimated at 4,000,000, and the English at 3,000,000. One million men are needed for the Persian Gulf, Egypt, Saloniki, etc. That leaves 6,000,000 to hold up 4,000,000 Germans, which looks like a waste of 2,000,000.

Turkey and Bulgaria offer the line of least resistance, and open the back door into the Austrian Empire. Of the two, Turkey is the more vulnerable, and the extra 2,000,000 men should be devoted to conquering her. Bulgaria could not stand long by itself. Therefore the proper strategy for the Allies now is to knock out the weaker units of the Central Coalition while keeping the strong ones in a state of siege, or in a state so closely approximating thereto as powers and resources may allow. The proper strategy for the Central Powers, on the other hand, would seem to be to knock out, if possible, Russia. She offers ground for maneuver which France does not.

## VETERINARY CORPS

See also

HORSES—CARE OF WOUNDED

## VILLA, Francisco

See

MEXICO—U. S. OPERATIONS IN, 1916

## VILLAGES

### —Fortification of

[The War on Land. By a Military Officer. *Army & Navy Gazette*, Aug 5, '16. 2500 words.]

Before the war we were told officially that a village afforded worse than no shelter under artillery fire, and that fortified lines should pass around and not through them. In spite of this, every village and hamlet is held as a strong point. It is partly due to ready-made cellars, and partly to the fact that supplies of timber, stone and iron exist on the spot.

The most difficult work in the conquest of a village comes when the attacker has forced his way into the front section. The artillery cannot operate effectively against the rear section until the gunner's telephone extension is complete. Until this is done, artillery fire may be disastrous to one's own troops; and the delay enables the enemy to organize. These conditions are emphasized when the village is on the reverse slope of a hill or concealed by a nearby wood thus preventing observation from a distance.

## VOCABULARY, Military

France

[Words Used in Official Communiqués. *Lectures pour Tous*, May 1, '16. 3000 words. Illustrations and Diagrams.]

(This article explains at some length vari-

ous technical words constantly used in the official communiqués, such as *camouflet*, mine producing no exterior crater; we have imported the word; *fourneau de mine*, mine chamber; *tir de barrage*, curtain of fire, etc. Among these and others, only one need be considered here, *élément de tranchée*, which is not a fraction of a trench, or part of a constituted trench, but a short trench in advance of the first trench, and communicating with it by a suitable communication trench. This apart, it is isolated, i. e., not communicating with other trenches to the right or left. Roughly, it forms a T projecting from the main trench, the cross-arm of the latter being the *élément*, and its shank the communication trench.)

## WAR

See also

NON-COMBATANTS

PREPAREDNESS FOR WAR

### —Casualties in

[The Losses in Campaigns are Less, in Comparison, than in the Great Wars of the Past. *Revista Militar* (Argentina), Jan, '16. 600 words.]

Although the totals of losses reach large figures, access to records at the conclusion of this war will show that up to the present the percentage of losses is less than in the great wars of the past. A loss of 10,000 men in an army of 2,000,000 is negligible, although the actual loss is large.

Modern firearms are less deadly. If the present war were being fought with sword and spear, with our present means of transportation and the enormous number engaged, and without the modern protection of trenches, the losses would be manyfold greater. A reversion to ancient methods of warfare would result in the destruction of the nations engaged.

With the invention of a new gun capable of killing at twenty miles comes a greater tendency to long-range fighting. The Russian artillery fired for months against the enemy without seeing a live German except a few prisoners.

Lieut. C. A. L. Totten, U. S. Army, publishes statistics showing that modern wars are less deadly. He divides the wars of the past 300 years into five periods as follows:

In seven battles, Leipsic to Senef, 1631 to 1634, the period included between the introduction of firearms and the use of the bayonet, the percentage of losses was 25.5.

In the second period of 22 battles, Hohenfriedberg to Bautzen, 1745 to 1813, the period of the "Brown Bess" and the bayonet, the percentage of losses was 20.7. In the third period of 11 battles, from Alma to Chickamauga, 1854 to 1863, the percentage decreased to 15.5. In the fourth period, that of the breech-loading gun, 6 battles, Königgratz to Sedan, 1866 to 1870, the proportion of losses was 11 per cent. And in the fifth period, 7 battles, San Juan to Mukden, 1898 to 1905, the percentage of loss did not exceed 10 per cent.

## WAR—Continued

### —Conduct of

[European War, Echoes of. IX—Continuation. Stratagems and Devices Used in War, By José Paulo Fernandez, Captain of Artillery. *Revista de Artilharia*, Mar, '16. 3750 words.]

(A brief reference to the usages of former wars in this respect in the endeavor to deceive the enemy, followed by a mention of the principal devices now being used in the European war to injure the enemy, such as bombs and arrows from aeroplanes, hand grenades, liquid fire, gases, etc.)

### —Effect of on Nature

[Nature under Gun Fire. By H. Thoburn Clark. *Land and Water*. 14 Sept, '16. 1700 words.]

At the beginning of the war it was supposed that the long battle fronts, extending over the greater part of the Continent, would seriously interfere with the migration of birds and drive them, affrighted, to seek paths less fraught with the sudden wild alarms of battle, that the battle fronts would be deserted by everything living, except those grim followers of war, the raven, vulture, wolf and jackal. Facts have proved these suppositions entirely wrong. Instead of the birds forsaking their ancient migration routes, they still travel along their aerial highways, undeterred by the thunder of guns, the marching of troops, and battles taking place below them. Instinct is too strong for the wild creatures of the plain and forest; and some of the most timid are to be found inhabiting the country where they were bred even though it is now that dread space, No Man's Land.

### —Governmental Conduct of

[War and Government. By "An Officer." *United Service Mag.*, Nov '15. 6500 words.]

(An article pointing out the weaknesses of representative government in time of war. There are a few men of outstanding ability in every government, but the balance are mere ballast. The English, supposed to have a genius for self-government, actually employ a committee of 22 persons to run the empire. After paying his compliments to France, Russia and Italy, as well as to the Germans, the neutrals are then touched upon. The author holds his comment on the course of the United States until the last, and his opinion is far from complimentary.)

[English Sidelights on the War. From English newspapers. *N. Y. Evening Post*, Dec 30, '15. 100 words.]

A saying of Gen. Joffre's is reported. "Method, science, mind and flexibility, were never so much needed in war as now; but he who attempts too much accomplishes badly."

[War and Government. By "An Officer." *United Service Mag.*, Dec, '15. Part II. 6500 words.]

(In this installment the author pays his compliments to the German government and

people for the solid front presented to the world in this war. News has been distorted, and while very genuine triumphs have been won by German arms, the General Staff will see to it that no doubt shall cross the mind of the proletariat. The author then addresses himself to conditions in England. Mistakes have been made in the operations of the censorship, but on the whole the published reports have given a fairer appreciation of the course of events than the publications in Germany. The subject of recruiting is touched, and the course of the Government criticized as lacking in firmness. The British merchant marine continues its operations, but 30% of it has been absorbed in transport operations. Germany's oversea trade has entirely disappeared.)

[Conduct of Military Operations. By P. Esmestev. *Voenny Sbornik*, May, '16. 4000 words.]

The first and essential requirement of the conduct of a war is an exhaustive study of everything connected with the war. A failure to conduct such a study is almost sure to result in possible disasters.

After this study has been made it will be necessary to decide whether to undertake offensive or defensive operations, or an offensive in one direction, and the defensive elsewhere. To do this intelligently we must have accurate knowledge of the enemy's organization, preparations, armament, general staff, etc. As much of the enemy's preparation will be secret, we must have recourse to the same method used by Napoleon and Moltke—a careful study of maps, showing railroad lines and means of communication open to the enemy. A careful estimate can then be made as to the probable centers of concentration which the enemy will use. We can then proceed to consider the places most suitable for our own mobilization, and the determination of these places is the cornerstone of the war.

The object of our initial operations must largely determine our method of mobilization. Napoleon in 1796, 1805 and 1809, and Moltke in 1870-71, had for their missions the seeking out and destroying of the enemy's main forces; in other words, various columns were directed on the principal opposing force with orders to attack wherever found. Moltke, confident in his superior strength, attacked quickly in order not to give the enemy time to take the best measures suitable for him.

In general, the plan of our operations to be adopted at the commencement of the war would be to attack one of the enemy's flanks, remaining on the defensive at other points. Of course, this is under the supposition that our army will be ready when war breaks out. The grouping of our forces must be such that at the critical moment they can all be usefully employed.

It is evident that the period of mobilization is the critical time for an army. Too great pains cannot be taken to insure the successful completion of the mobilization.

French writers on strategy have advised that the initial concentration of forces should be under the protection of strong covering forces. The best operations to undertake against such forces would appear to be, according to German views, to send cavalry forces forward on a broad front. The advance of Napoleon on Ulm was of this general nature. But in 1812, notwithstanding that Napoleon, according to his own statements, had never before made such preparations for a campaign, and had never before had such a large army, his advance was not so successful as we might have expected it to be. The reason for this was that in the Ulm campaign each French army corps had a separate line of advance, along which magazines had been accumulated in advance, thus permitting a rapid and uninterrupted movement forward. And the Germans in 1870-71 similarly began their campaign by giving each army a separate independent line of communication, along which great quantities of stores had been accumulated in advance.

The foregoing statements point out the need for the very careful and complete preparations necessary in advance of a campaign to insure its success. And as Von der Goltz points out, it will be necessary for large armies to rest on large bases in order to insure the possession of the necessary supplies and the service of sufficient railroads to provide for their maintenance.

Care should be taken to see that there are sufficient railroads and stores to insure the success not only of the army's mobilization, but of its initial operations as well. In Napoleon's time war supported war, but in modern times it is necessary to be always prepared.

See also

ADMINISTRATION, MILITARY—WAR DEPARTMENTS AND MINISTRIES  
ARMY—RELATION TO THE STATE

—Laws of

See also

AERONAUTICS—LEGAL REGULATION OF  
BLOCKADE  
ESPIONAGE  
EUROPEAN WAR—REPORTS OF ATROCITIES  
PROPERTY RIGHTS (IN WAR)

—Moral Forces in

[The Noise of Countless Wars. By Col. A. C. Yate. *United Service Magazine*. Jan, '16. 3200 words.]

(Discussion of the war attitude of the English people, and criticism of national leadership and of the blunders in the Balkan diplomatic negotiations.)

[Note. *Army & Navy Jour.*, Feb 5, '16. 300 words.]

The talk about how long the belligerents in the present war can keep on is foolish. Determination amounting to frenzy will carry a people to almost any length. Paraguay sustained a war against Brazil, Argentina and Uruguay for several years although outnumbered twenty to one. At the end she had literally

no men left and her population of 1,200,000 had been reduced to 200,000 when she finally succumbed in 1870. Old men, even women and children took part in the struggle. And this was in modern times.

[Patriotic Address Delivered at a Field Mass in "El Palomar." By Padre Gregorio Laulhé. *Revista Militar* (Argentina), Mar, '16.]

Oration to the officers and men of the Cavalry School. An invocation to love of country and of the profession of arms, in which the military virtues of bravery and devotion to duty are extolled. The army is the national school to foster and perpetuate patriotism, honor, valor and unselfishness.

[A Plea for Mission and Doctrine. By Major John N. Russell, U. S. M. C. *The Marine Corps Gazette*, June, '16. 5500 words.]

The military forces of Germany and France serve as a "standard of efficiency," to which military organizations can and should be trained. Great strides have been made in our Marine Corps, but there are still some factors that go to make efficiency that have been overlooked or not sufficiently emphasized. It is for the purpose of succinctly pointing out these deficiencies and suggesting remedies that this article has been undertaken.

### Efficiency

Efficiency is often defined as "the quality of producing results," altho the necessity for a high degree of efficiency in a private organization is great and is usually stimulated by competition and money greed, in a public organization, especially in a military or naval organization, the necessity for the maximum efficiency becomes peremptory, while the life giving influences which assist the private concern are lost.

To be truly efficient, a military or naval organization must be prepared to place at the command of its government and in the shortest possible time, all its power.

The governing factors of such efficiency are: (a) organization, (b) matériel, (c) personnel, (d) policy, (e) leadership, (f) discipline, (g) morale, and (h) doctrine.

An organization combining all these factors would be an *organic mass*, capable of exerting all its power.

### Organization

Public or governmental business, like private business, is created by demand. The principle of the division of labor applies, likewise, to both these forms of activity. In each case the organization must be such as will best suit the fulfillment of the "general mission."

The writer believes that the "general mission" of the Marine Corps is: To co-operate with the navy, in peace and war, to the end that in the event of a war the Marine Corps could be of greatest value to the navy. In years of peace, "special missions" are apt to become so numerous that they obscure the real issue.

The "general mission" of the Marine Corps

**WAR—Continued**

should be drawn up by a board of marine officers and ratified by a conference of field officers. Every officer on entering the corps would be at once instructed in the mission of the Marine Corps, and commanding officers would preach it to their subordinates.

*Personnel*, of obvious importance.

*Matériel*, depends to a large extent on organization and personnel.

*Policy*, the system of management necessary to accomplish the "mission." For governmental organization, policy is governed largely by regulations, but much is left to commanding officers.

*Leadership*.—The qualities that go to make a leader of a military organization are: will power, intelligence, resourcefulness, health, and, last but not least, professional knowledge and training. Personal magnetism may be of assistance to a leader, but a development of the above factors is most essential. Of prime importance is a study of psychology and of its relation to discipline and morale.

Leadership may be either actual or directive, actual in the lower grades of the commissioned personnel of a military organization, and directive in the higher commands.

While the preparation for leadership must be left to the individual, the Marine Corps could materially assist its officers by pointing out the road and by establishing and maintaining schools where officers could receive the best theoretical and practical training.

*Discipline*.—Years ago Kempenfelt wrote: "The men who are the best disciplined, of whatever country they are, will always fight the best."

It may be said that the more lax the rule, order, method of action, or living in a country, the stricter should be the discipline in the military and naval organizations of such a country.

A study of the best method to be employed in obtaining excellent military discipline implies a study of the psychology of suggestion and of its application to military life.

This study should be made imperative in the Marine Corps.

*Morale*.—The methods of increasing morale should be studied by a board of officers and embodied in a manual.

*Doctrine*.—The art of war has its theories and its principles, otherwise it would not be an art. It follows that it also has the application of its principles or *doctrine*. This word means a teaching that provides for a "mutual understanding" among the commissioned personnel. In plain words, "team work."

Military doctrine is the application of principle. A principle cannot be wrong; it is a *fact*. A doctrine, on the other hand, may be wrong. As it becomes ripened by experience or to suit new conditions, it is altered.

All the great powers of the world, except the United States, have instilled into their armies and service doctrines of war which have inspired them with new life. Witness France, whose indoctrinated armies are holding at bay the indoctrinated German troops.

Flexibility of command spells "initiative." Initiative may be either reliable or unreliable. The introduction of doctrine means *reliable initiative*.

Moltke, the great exponent of doctrine, required of detachment commanders "a high degree of technical skill, with minds trained to work in unison with that of the higher command, even when separated from headquarters by a distance which made control impossible."

It was the inculcating of doctrines into the Prussian Army which permitted the introduction of the "cult" of the offensive which now permeates the German army.

The usual illustration for the necessity of a doctrine is that of separate columns advancing on a broad front. Each column commander knows that, on making contact with the enemy, he can boldly take the offensive, with the full assurance of the absolute support of the columns to his right and left, and the knowledge that their interpretation of the various situations that may arise will be the same as his own.

A military organization, to be efficient and powerful, must be so indoctrinated as to acquire a uniformity of mind and action on fundamental military truths.

We demand "initiative" of subordinates and yet fail to train them for an intelligent initiative. What, then, can we expect?

If our organization is doctrineless, a subordinate cannot arrive at an intelligent understanding of orders as now written in the Moltke style. Detailed orders are necessary with a consequent absence of initiative and poor results.

The lack of doctrine in the Marine Corps necessarily reduces the "efficiency" of the Corps. The Marine Corps may be called on in the near future to face trained, seasoned, highly disciplined, and indoctrinated troops. Lacking a doctrine, no matter how good our organization, personnel, discipline, and morale, we would unquestionably be badly handicapped.

Why should we not, in terse language, lay down certain military principles that we believe are applicable to the Marine Corps? Why should we not formulate a concise and clear doctrine?

Why should we not formulate our traditions and incorporate them in our doctrine? Why should we not have a "cult" of the offensive?

Such action would greatly increase the usefulness, efficiency and prestige of the Marine Corps, and tend to unite this organization into one *organic* whole.

**—Treatment of Enemy Aliens in**

["Under Modern Conditions, When a State of War Exists, How to Deal with a Hostile Alien Population in Our Midst." By 2nd Lieut. S. T. Sheppard, Bombay Volunteer Rifles. *Jour. United Service Inst. of India*, July, '16. 7000 words.]

Methods of warfare change, and new ways must be devised to deal with questions such as contraband and enemy aliens. In early times, enemy aliens were put to the sword.

Such methods were succeeded by detention, arrest, and even toleration of well behaved enemies. Each country must decide for itself how to handle alien enemies, being guided by self-interest and also by enemy behavior in this respect.

The question for Great Britain and Germany in the present war differed because there were only 5300 British subjects detained in Germany, while there were 27,200 Germans over 17 in Great Britain. Prolonged negotiations failed to discover any satisfactory basis of exchange. Even so, there would remain the question of aliens in the oversea possessions.

The number of enemy aliens in India is not accurately known. In April, 1915, 625 alien enemy missionaries were under detention or supervision. The next census should be made to give accurate data concerning aliens. In any case there were enough enemy aliens to do untold injury if left at large in India.

There is evidence to show that the enemy (Germany) hoped to embroil India and the middle east so as to require a large British force in India, yet repressive measures were taken only after much delay. The vocation and particularly the religion of aliens offer problems in their treatment, but modern war is not carried on by naval and military forces alone. An enemy civilian may be a far greater danger than an enemy soldier.

Wholesale internment is objectionable, costly, and diverts necessary guards from the military service. The correct solution is wholesale and immediate repatriation. The objections are the difficulty of transportation and the repatriation of males of military age. The former can be solved, and the addition of a battalion of men of military age is not a great advantage, and would be compensated by the release of guards. Known or suspected spies would of course be detained.

(Questions of details of repatriation in the case of war with Turkey, France and Portugal are then discussed, after which it is concluded:—)

Thus there is no reason why the repatriation of white alien enemies should not be carried out in the event of war with any European power or with the United States. For Japan, a combination of repatriation and internment might be advisable.

One possibility is that of an alien who by long residence gains the trust of native chiefs, and whose dismissal would cause grave inconvenience. But loyalty such as has been shown would survive this trial.

Army headquarters must have a determining voice in the settlement of the method of dealing with alien enemies. It is essentially a military question, to be settled by military authorities. Otherwise there will be a repetition of the experience of 1914-1915, when it has taken over fifteen months to remove a few hundred enemies from our midst.

#### WAR OF 1812 (U. S.)

[The Expedition to Plattsburg, upon Lake Champlain, Canada, 1814. By Major-General

C. W. Robinson, C. B. *The Journal of the Royal United Service Institution*, Aug, '16. Map. 12,000 words.]

(A historical sketch, touching upon the striking similarity between some of the circumstances and events which have marked the early years of the 19th and 20th centuries, and briefly outlining what happened during the expedition, with an account of the operations from the journal of the late General Sir Frederick Philipse Robinson, who commanded one of the brigades which made up the expedition.)

#### WAR COLLEGES

See

STAFF COLLEGES

#### WAR CORRESPONDENTS

See also

PRESS CENSORSHIP

#### WATERLOO, Battle of

[Some Aspects of Great Campaigns. Waterloo. By Lieut. R. G. Cherry, R. F. A. *Jour. Royal Artillery*, Sept, '15. 6500 words. 1 map.]

To the student of military history, the great campaigns of the last hundred years furnish valuable illustrations of the truth of the maxims and rules of war; and they are full of instances of correct conceptions of plans of campaign, of movements and decisions, thus affording lessons to assist future leaders in handling similar situations.

Waterloo is the first in chronological order.

*Diary of events.*

March 1, 1815. Napoleon lands at Cannes.

March 20. Napoleon enters Paris.

April 5. Wellington takes command of Anglo-Allied army at Brussels.

May 1. Allied armies in cantonments on a 100-mile arc from Audenard to Liège.

June 14. French concentration completed about Beaumont.

June 15. French advanced columns drive in Prussians from Marchienne, Charleroi, and Chatelet on Ligny. Napoleon's right wing moves toward Ligny followed by the center, and his left moves on Quatre Bras, held by Perponcher's Dutch-Belgian brigade.

June 16. Ney, with French left, attacks Perponcher who is reinforced by Wellington. Napoleon attacks Prussians at Ligny at 2 p.m. and defeats them at 9 p.m.

June 17. Blücher retreats on Wavre, being joined there by Bülow. Wellington retreats on Waterloo and is joined by Hill. In the afternoon Napoleon sends Grouchy after the Prussians and follows up Wellington himself.

June 18. Battle of Waterloo. Napoleon attacks Anglo-Allied army. Blücher marches from Wavre with three corps, leaving Thielmann's corps to contain Grouchy. At 7.30 p.m. Prussians come into action on Napoleon's right flank. Napoleon defeated. Grouchy defeats Thielmann at Wavre but retires upon hearing of Napoleon's defeat.

#### 1. The influence of the initiative on the strategic concentration.

The political situation in Europe in May,

**WATERLOO, Battle of—Continued**

1815, precluded the allied forces assuming the initiative at an early date. Of the 600,000 troops which could be brought against Napoleon, only the two armies of Wellington and Blücher, numbering about 210,000, were within striking distance of the French frontier. Time was required for armies assembling on the Rhine and in Poland to concentrate and invade France. Wellington had to cover Ghent and Brussels in addition to his lines of communication leading to Antwerp and Ostend; Blücher had to cover his lines of communication leading through Namur and Liège to Cologne. Thus the allied army was covering a front 100 miles long, viz., the Anglo-Allied army from the River Scheldt to the Brussels-Charleroi road with a reserve of 33,000 men at Brussels and 15,000 cavalry at Ninove; the Prussians, from Thuin through Dinant and Namur to Liège.

Therefore the initiative fell to Napoleon. To strike the first blow he had 125,000 veterans, numbers superior to those of either Wellington or Blücher, but inferior to the two combined.

Napoleon's plan was to strike the allied line near the center, separate the two armies and holding them with his two wings, crush each in turn with his center. Accordingly he concentrated secretly, his left wing 43,000 strong under Ney, at Solre-sur-Sambre; his center, 63,000 at Beaumont; and his right, 16,000 under Gerard at Philippeville.

### *2. Action of strategic advanced and rear guards.*

(a) Napoleon's advanced guard on June 15.

The three columns were ordered to leave their bivouacs at daybreak on the 15th and cross the Sambre at Marchienne, Charleroi, and Chatelet respectively. The left column was to advance on Quatre Bras and feel for Wellington's left flank; the center was to push back the Prussian advanced troops toward Fleurus; and the right was to co-operate with the center by menacing the flank of any Prussian force delaying the center column.

By 11:00 a. m., Ney's leading corps had crossed the Sambre, but was held up until 4:00 p. m. at Gosselies by a Prussian brigade which then retired east. At Frasnes, the advanced troops of Perponcher's Dutch-Belgian brigade were driven back on Quatre Bras and Ney halted for the night and reconnoitered the enemy's position.

The center and left columns were delayed in starting and considerable resistance was encountered at Charleroi bridge which was not carried until midday. The advance on Sombreffe then was taken up, but more resistance was encountered at Gilly and the column halted for the night with its leading troops short of Fleurus. Gerard halted for the night astride the Sambre at Chatelet. The effect of these delays was to be seen the next day in the battle of Ligny.

(b) Action of Zieten's Corps on June 15.

Zieten's corps, with headquarters at Charleroi, covered the line of the Sambre from Thuin to Moustier. Only the 1st and 2nd

brigades were available early on the 15th to oppose the French. The 2nd brigade was ordered to hold the bridges near Charleroi covering the withdrawal of the first by a flank march to Gosselies; the 2nd then was to fall back on Gilly and the rest of the division to concentrate on Fleurus. The 2nd brigade held the bridges by hard fighting until about 11:00 a. m., but as the 1st was not yet clear, part of the 4th brigade was sent to Gosselies to cover its withdrawal. The 2nd fell back to Gilly where it held on until about 6:00 p. m. Again at Lambusart it faced about and checked the pursuing French cavalry. The two brigades joined the corps late that night near Ligny where Blücher was concentrating his army. This rear guard held Napoleon's center and right to an advance of but 5 miles in 8 hours and gained time for Blücher to bring up the Corps of Pirch and Thielmann for the battle next day.

### *3. Functions of containing forces.*

(a) Ney at Quatre Bras.

Napoleon's plan for the 16th was to hold Wellington with the left wing under Ney, attack Blücher with the right under Grouchy and hold the Prussians to their ground while he crushed them with the center. The rôle of the left wing then was that of a containing force with the double function of holding Wellington and keeping part of the force in hand to co-operate with the center against the Prussian right flank. Ney was ordered to occupy Quatre Bras, but as nothing was said about haste, he was cautious and did not attack in force at once, giving Wellington time to reinforce the troops there. In despatches sent to Ney in the afternoon the necessity of his co-operating against the Prussian right flank was emphasized, but Ney either misread them or thought he would be acting in the spirit of the order by defeating the troops in his front. He detached no troops to aid the center and even recalled D'Erlon's Corps which had been directed on Ligny by the bearer of Soult's despatch. As a result D'Erlon assisted neither center nor wing.

Ney's failure correctly to interpret Napoleon's plan made the Prussian defeat at Ligny less serious than it might have been with the assistance of D'Erlon's Corps.

The Prussians were driven from the field of Ligny on the night of the 16th and were out of action for at least 24 hours. On the morning of the 17th Ney did nothing and Wellington retreated on Waterloo about midday. It is true that not until midday did Napoleon order Ney to attack, but it is believed that a general who appreciated the duties of a containing force, would have realized that he must not let go his grip on his enemy until the decisive blow is struck. Had Ney attacked early in the morning, it is difficult to see how Wellington could have escaped heavy losses.

(b) Grouchy after Ligny.

At 9:30 p. m. the 16th, the Prussians were Wavre, Thielmann's Corps covering the retreat. They were not pursued and the French completely lost touch with them. At noon on the 17th they were in full retreat from Ligny in the direction of



the 17th, Napoleon detached Grouchy with the right wing to follow up the Prussians. Grouchy's march was delayed by wet roads and by orders sending him in the wrong direction. He did not finally come up with the Prussians until 4:00 p. m. on the 18th, when he encountered Thielmann's rear guard in front of Wavre. About this hour he received a despatch from Napoleon ordering him to maneuver toward Waterloo and operate against the Prussians who were threatening Napoleon's right. Grouchy's troops already were committed to the attack, and it was too late to change direction.

Grouchy's mission was that of the commander of a detached force pursuing a beaten enemy and containing it from a distance. He believed from the information he had that the Prussians had retired on Louvain, with the object of forming a junction near there with Wellington's troops, and therefore when he heard the guns at Waterloo about noon, he had no reason to believe a great battle was taking place. In the absence of later orders, he carried out the letter of the original order to follow the Prussians.

#### 4. Intercommunication and orders

Perhaps the most useful lesson to be drawn from a study of this campaign is the vital importance of constant intercommunication in an army, and the correct and prompt delivery of all orders, instructions, and messages. Neither army made an attempt to organize a communication service, and orders were mislaid, delayed, or misunderstood through failure to observe principles now laid down in all handbooks.

Orders were badly written, not expressed clearly, and did not give essential information of the situation. Corps and other commanders were not prompt in transmitting reports and information to higher authority and to each other. Full advantage was not taken of all means to secure the prompt and certain delivery of orders, as, for example, sending them by two couriers.

#### WATER SUPPLY

##### —By Motor Tanks

[Note. *Army & Navy Jour.*, Mar 25, '16. 300 words.]

Three motor water wagons of 600 gallons capacity each have been purchased for use in Mexico by the N. Y. Depot Quartermaster, and they will be on the way south very shortly. They were new motor tank wagons secured from the Standard Oil Co. through the White Motor Co.

##### —Field Water Bag

[Water Supply in Mexico. *Army & Navy Register*, Apr 1, '16. 300 words.]

Three motor trucks carrying 600-gallon tanks are in use with the expeditionary force in Mexico. Water bags are also in use. One type for use in camp holds 38 gallons, is suspended from a tripod, and costs \$7.80. The other type holds 20 gallons and costs \$12. They are carried in pairs on pack mules. Both types are made of heavy can-

vas. The water in a bag is purified by the use of 1-gram tube of hypochlorite of calcium. These tubes cost 6 cents per hundred.

[Note. *Army & Navy Jour.*, Aug 26, '16. 250 words.]

The field water bag designed by Maj. W. J. L. Lyster, Med. Corps, has proven valuable on the border. The bag weighs 7 to 7½ lbs. and has a capacity of 330 lbs. of water. Sterilization is by glass tubes of hydrochloride (hypochlorite?) of lime. A package of 60 tubes weighs 100 oz. Two water bags are issued to each company.

##### —For Camps

[Water Supply for a Semi-permanent Camp of a Division. By Capt. F. C. Harrington, Corps of Engineers, U. S. A. *Professional Memoirs*, May-June, '16. 13,000 words. 5 plates.]

The water supply of the semi-permanent camps established in this country has generally been the result of a patchwork of expedients. For mobilization camps and concentration camps in war and peace, however, the water-supply project may advantageously be worked out beforehand. This discussion is limited to the case when water is to be obtained from driven wells.

**Quantity.**—From a consideration of figures given by various authorities, an allowance of 30 gallons per man per day and 13 gallons per animal is adopted as a liberal one. This makes the total daily requirement for a division at war strength to 757,500 gallons. The restricted day's supply is put at 184,000 gallons, and the maximum hourly rate (from 4.00 to 5.00 p. m.) at 265,000 gallons, about a third of a whole day's supply.

**Wells.**—[Here follows a classification of types of wells and a formula for calculating probable yield.] Too much reliance, however, cannot be placed on calculations; the only true tests are those obtained by actual pumping. The "Geologic Folios" published by the Geological Survey give valuable data for many localities in this connection; and their experts, when available, are best qualified to locate wells. [With certain assumptions as to character of soil, it is estimated that 3 driven wells, 100 ft. deep, with 6-inch casing, spaced 100 ft. apart, will furnish the required amount of water; a fourth well is added for use in case of emergency.] These wells should be located on low ground, but at least 50 ft. from streams and 200 ft. from the nearest picket line. The driving would generally be done by contract, by the methods illustrated in the plates.

**Storage.**—Considering the great fluctuations in demand, a considerable storage capacity is necessary; 200,000 gallons is the figure adopted. Where an artificial reservoir is required, an elevated tank is usually preferable to a stand-pipe, and is chosen in this case. Steel is preferred to wood for tanks of over 100,000 gallons capacity. The factors of *height* and *location* of the tank are closely related; in balancing the advantages of a

**WATER SUPPLY—Continued**

central location against those of utilizing available natural elevations, the item of cost governs. The elevation of the tank determines the available head, on which, in turn, is dependent the design of the distributing system. A height must be selected arbitrarily for the tank as a starting point; and for the assumed case the elevation of the bottom of the tank is taken as 50 ft. The design of the tank is a comparatively simple problem. [Here follow some details of the tank, which is 32 ft. in diameter and 36 ft. high.]

**Pumping Plant.**—[A sketch map of the locality is here assumed, in order to fit the project to the ground.] The disadvantages of suction pumps are such that air-lift apparatus is deemed best adapted to the task of raising the water from the wells. Though not economical for depths less than 300 ft., this system is extremely simple and easy to operate. [Here follow details of the plant.] For the compressors, two units are selected, each consisting of a 35-horsepower gasoline engine and a compressor working at a pressure between 35 and 65 lbs. per sq. in. A 10-inch cast-iron pipe 9-16 inches in thickness leads to the tank 1400 yds. away. For this service, two water pumps are installed each with 30-horsepower gasoline engines. A small reservoir or tank at the pumps is essential. The entire plant is designed to work at double capacity during the periods of maximum demand.

**Distributing System.**—Cast-iron pipe is used throughout, except for the small connections. The proportioning of the sizes is a matter of "cut and try"; the graphical formula in the latest edition of *Trautwine* is convenient for such computations. The sizes range from 20 inches down to 8 inches; there are in all 9 mains running through the camp, perpendicular to the longest dimension. (Arrangement shown in plates, assuming camp as given in *Field Service Regulations*. Plans for the company bathhouses are also given and discussed.)

**—In Sieges**

[Various Systems of Supplying Potable Subsoil Water to a Besieged Fort. By Pasquale Baglioni, Capt. of Engrs. *Rivista di Artiglieria e Genio*, Jan-Mar, '16. 12,500 words. 5 plates.]

One of the first steps taken by a besieging army is to cut off the water supply of the besieged force. In some cases this weakens the defense to such an extent as to cause surrender without decisive combat. It is true that existing fortresses have cisterns holding a reserve water supply, but the amount of water thus held is small and its quality questioned. The only safe precaution is to seek water in the subsoil. Such water may be obtained:

- (1) From natural springs.
- (2) From ordinary wells.
- (3) From absorbent galleries in permeable strata.
- (4) With drains in similar strata.

- (5) With tubular wells driven into deep strata.

**Utilization of Springs**

Springs are natural outlets of subsoil waters. They are found at breaks in the earth's surface, where an impermeable stratum is overlaid by a permeable stratum rich in water, or where water under pressure between two impermeable strata escapes through a break in the upper stratum. They are sometimes found where water held by impermeable banks in a subterranean basin rises above the level of the ground. The flow of a small spring may be measured by taking the time required to fill a vessel of known capacity, of larger springs by the filling of an excavated basin in the same way, and of still larger ones by building a dam and applying a formula for the measurement of discharge over a dam.

A spring should be cleaned out, measured, and covered. Means should be provided for leading the water to the point of use.

**Utilization of Ordinary Existing Wells.**

Ordinary wells usually have a limited output and are frequently veritable sources of infection. The introduction of water supply systems in cities and towns has caused wells to be neglected, so that they are not likely to be found in condition for use when needed for military purposes. Their capacity should be measured by actual trial, preferably during a period of draught; the purity of the water must be investigated, and means for distribution must be provided, either by conduits or by water carts.

**Sinking of New Wells**

Where geological conditions indicate the probability of striking water, it is advisable to sink new wells. As a rule they are not more than 4 m. in diameter nor 20 m. in depth. The following conditions should be fulfilled:

1. The wells should be remote from sources of infection and should extend down at least 50 cm. into an impenetrable stratum underlying a permeable water-bearing stratum.
2. The lower section of the casing, in the permeable stratum, must have openings for the ingress of water. The remainder of the casing must be watertight.
3. The well must be covered, with provision for access by the custodian.
4. The surrounding ground must have a water-tight paving, sloping away from the well.
5. The water must be raised with a pump, not with buckets.

In ordinary shallow wells the excavation is made with the assistance of shoring where necessary, and the casing is then built upward from the bottom.

In soft earth the casing is supported on a drum of metal or timber. As the excavation proceeds, the drum and casing sink, the latter being built up continuously at the top.

Another way is to excavate as far as the sides will remain vertical, then to construct a casing for this section. The next section is then excavated first with a smaller diame-

ter and sills and props are set to hold up the casing already in place; the section is then excavated to full diameter and the casing for it is built; and so on till the desired depth is reached.

In some cases each succeeding section of excavation is made a little smaller in diameter than the section next above, leaving a berm for the support of the casing above.

Where great haste is necessary, the well may be made rectangular in cross section and may be lined with frames and sheeting as in mining operations.

In the construction of important wells, especially where the necessary equipment can be had, the compressed-air method may be used. The sinking is done without the use of compressed air until water is met, after which the work must be done in compressed air. The lower section of casing is built in the working chamber under pressure; the remainder of the casing is built in the open air above the working chamber as the latter descends.

#### *Filtering Galleries*

Where a water-bearing stratum is found at a small depth, it is sometimes convenient to run a system of filtering galleries to collect the water. They are often placed under the bed of a river or parallel to its bank, a little below the level of the water at low stage. The water undergoes a process of filtration in its passage through the river bed into the gallery.

The galleries are generally not more than 10 m. long and have a slope of from 2 to 5 on 1000. For short distances they may have a slope of 1 on 10. They may be rectangular or oval in cross-section, with a height of 1 m. and a width of 0.6 m. They are lined with timber or stone where the nature of the ground makes it necessary. The water collected by the galleries is led into a large well from which it is conveyed where needed.

#### *Drains*

Drains are used for the collection of surface water and are resorted to only in case it is impossible to install a more hygienic system. They are conduits of small cross-section laid underground at depths usually not more than 2 m. They find their best application when they can be laid on an impermeable stratum overlaid by a permeable stratum carrying water. Their yield will depend on the rainfall, the nature and depth of the superficial strata, and the climatic conditions that affect evaporation.

#### *Tubular Wells*

These are wells of small diameter, 4 to 50 cm., extending down to subterranean streams at varying depths. In security from disturbance by the enemy and in hygienic superiority, they are the best means of obtaining water for a besieged place. They are called artesian wells when they reach water under sufficient pressure to rise above the ground. They are sunk by the following methods:

1. Boring.
2. Driving with a rope.

3. Driving with wooden rods.

4. Drilling with the diamond drill or a drill of carborundum or hard steel.

In the first method the hole is bored with a tool like a post-hole auger, the shank being lengthened by the addition of sections as the work progresses. After about each meter of progress the auger is pulled out with a rope and capstan and is freed of earth. This method is used in soils of clay or marl.

The second method is used for a considerable depth. The hole is made by a heavy drill suspended by a cable from a tower 10 to 30 m. high. By a lever operated by machinery the drill is raised and let fall at a rapidity reaching 60 blows per minute. Special apparatus is used for clearing the hole. This method is used in hard material, and the progress varies from 8 m. per day in lime-stone to 0.5 meter per day in very hard rock.

The third method is similar to the second, except that the stem of the drill is lengthened with wooden rods as the work progresses. In some cases iron rods are used instead of wooden ones. The method is applicable to depths as great as 500 m. and the progress is from 0.5 m. to 2 or 3 m. per hour.

The fourth method, with the diamond drill or other similar hard drills, is used to great depths, sometimes 1800 m. The drill is usually set with 6 to 12 black Brazilian diamonds of about 8 carats each. They cost about \$10 per carat. The high cost of the diamonds and the ease with which they are lost have caused the use of carborundum or very hard steel in place of them. Progress of 8 m. per hour has been made with this method and it has the advantage of preserving a core in the center of the hole which gives accurate knowledge of the strata penetrated.

Tubular wells are always cased, except when they pass through very hard and compact rock, with galvanized iron, steel, or copper pipe. The casing sinks usually by its own weight or if necessary may be forced down with driving apparatus or hydraulic jacks.

If the casing goes down readily, pipe of one diameter may be used for the entire depth. In case the pipe is difficult to put down, sections of successively smaller diameter may be used from top to bottom.

Special precautions are taken to seal the casing against the ingress of any water except that at the lowest stratum.

A simple and useful form of the tubular well is made without previous boring by driving into the ground a "point" consisting of a perforated pipe having a sharp point at the lower end. This is driven with any simple and convenient form of hammer and short lengths of pipe are added as needed. The limit of depth is reached at about 7.5 m. The well is completed by fitting a pump to the top of the pipe.

#### *Pumps and Conduits*

Subsoil water must usually be pumped to the surface for use. The water is raised by centrifugal or piston pumps or hydraulic rams. Choice of type will depend upon availability

**WATER SUPPLY—Continued**

of equipment and of means for its operation. Suction is limited to about 7.5 m. for the piston pump and 5 m. for the centrifugal. The latter type will force water to about 15 m. above its own level; the piston type will pump water to any desired height.

After being raised to the surface, the water is led to the point where it is to be used. This may be done in open channels or in closed conduits in which the water flows under pressure. If the water comes from many scattered sources of small output, it may be transported in carts. Existing conduits may be utilized if they are of suitable capacity or can be made so.

**Distribution**

The distribution of water must be under strict supervision to prevent waste. The water should be led to hydrants to which access may be had at all times if the supply is ample, otherwise during specified hours.

**Purification**

Water from deep strata is usually free of disease germs. It may require aeration, which can be effected by currents of air passing over the water as it flows in an open channel, or by creating waterfalls in the course of the flow, or by causing it to fall like raindrops through an aeration chamber. If the water contains mineral salts, these may be precipitated by the addition of an appropriate chemical. The water may be clarified by filtration through sand or various special filtering materials.

In some cases water is affected by the growth of algae. This usually results from the presence of air and light in the conduit and the remedy is their exclusion.

Contamination by surface water will necessitate sterilization, which may be effected with lime or bromine. Other substances used for this purpose are permanganate of potash and sulphate of alumina. Ozone is effective in the destruction of organic matter. There are many types of apparatus for the sterilization of water with electrically produced ozone.

From the foregoing discussion, it is evident that much thought, experiment, and labor will be required in providing the water supply for a besieged garrison. It is a subject worthy of study in time of peace by those officers upon whom this important duty will fall.

**WATSON, Lt.-Col. Jonas, R.A.**

[Jonas Watson, First Lieutenant Colonel of the Royal Regiment of Artillery. By Lieut. Col. H. W. L. Hime (late R.A.). *Jour. Royal Artillery*, July, '16. 3000 words. 4 tables.]

(An account of the services of the officer named from 1693 to his death in 1741. The account is fragmentary by reason of lack of data. Of historical interest only.—Ed.)

**WIND****—In Aeronautics**

See

**AERONAUTICS—THEORY OF****WIRE, Barbed**

See

**BARBED WIRE ENTANGLEMENTS****WIRELESS TELEGRAPHY**

[Radio Communication. How the *Goeben* and the *Breslau* Evaded the Allied Fleet. *Scientific American*, May 13, '16. 300 words.]

After giving the impression that his vessels were heading for the Adriatic, the German admiral suddenly made a dash for Constantinople. The maneuver was observed by a British cruiser, but her wireless efforts to warn the British ships at Malta and at the Straits of Otranto were "jammed" by the German radio operators until too late for the British ships to interfere.

**Spain**

[Radio-telegraphic Station at Ceuta. By Don Tomás Fernández Quintana, Captain of Engineers, Spanish Army. *Memorial de Ingenieros* (Madrid), Nov and Dec, '15. 6000 words. Plans and illustrations.]

The station is situated on a hill west of the town of Ceuta, with lower and open country to the north, so as to provide certain communication with Madrid. One steel lattice tower, 60 meters in height, carries the antennae. The cross section of the tower is triangular, 1.20 m. on each side. The antennae are strung from 18 posts placed on the vertices of a regular polygon of which the tower is the center. The Telefunken system is used.

(A complete technical description of the installation is given.—Ed.)

[New Wireless Station. *New York Times Magazine*, Oct 29, '16. Quoted.]

Two new wireless stations are to be established by the Colombian Government, one at Arauca, on the Colombia-Venezuela frontier, the other at Orocué, on the Meta River, some 200 miles east of Bogota.

Spain has erected a new wireless station at Cape Juby, on the Atlantic coast of Africa. It is less than 100 miles from the big wireless station on the Island of Teneriffe, Canary Islands. Cape Juby is a sandy and almost barren projection, a part of the Western Sahara, which extends along the Atlantic coast of Africa and connects the Mogador district with the Spanish possessions of Rio de Oro. Regular steamship service has been established between Cape Juby and Teneriffe.

**—Apparatus and Equipment**

[Radio Communication for Field Artillery. By Lieut. H. G. Ferguson, N. G. Cal. *Field Artillery Jour.*, Apr.-June, '16. 1200 words.]

(Note. This is an account of the installation of a wireless station, Marconi type, in the armory of the author's battery. It is intended for the education of the members of the battery in the fundamentals of wireless telegraphy, and it is hoped that eventually a portable wireless outfit will be developed. A transformer of the closed core type has been installed to raise the feeding current to 42,000 volts.

The sending mechanism is a complete Marconi set, consisting of the ordinary oscillating transformer rotary gap, with a speed of about 2000 revolutions per minute, induction coil,

helix, plate glass condenser, key and apparatus for installation. The station is controlled by the requirements of Federal laws. The receiving apparatus is a slight variation from the Marconi type. A special loose coupler, navy type, is used to vary the wave length used in receiving messages.)

—Apparatus and Equipment—Portable

[Note. *Army & Navy Jour.*, Mar 18, '16, 200 words.]

Wireless telegraphy is to be used to maintain communication with the force in Mexico. There are permanent radio-stations at Brownsville and Fort Sam Houston, and through these and field sets, communication is maintained with all troops along the border. There are three tractor sets of 300 miles radius for use at headquarters, and a number of wagon sets of almost equal power. For shorter distance communication, there are two-mule pack sets of about 20-mile radius. Signal companies also carry field telegraph outfits with about 40 miles of wire.

See also

DIRIGIBLES—GERMANY

—Methods of Securing Secrecy

[Remarks on the Use of Wireless Telegraphy in the Field. By Ramiro R. Borlado. *Memorial de Ingenieros*, Nov, '15. 2400 words. Diag.]

Wireless telegraphy, like every other advance in science, has found immediate application in the Art of War. Its immense service in commerce and navigation, affording communication between vessels and with the shore, especially in time of danger, is fully recognized; and it is now being used to manipulate fog signals (including warning guns) in dangerous places on the coast. Communication between armies and fleets and even between belligerent governments is no less important than the peace-time applications of this new science. Admiral Togo used wireless to great effect in the Russo-Japanese war, and in his report recognized the value of this service. The late Balkan wars and the present great European war manifest its value.

At the outbreak of hostilities the nations equipped with powerful radio stations are in instant communication with their fleets, colonies and diplomatic agents in all parts of the world. Equally, vessels of war and commerce have been able to spread false information as to their locations.

Some authorities have argued for the exclusive use of wireless, but the best opinion inclines to a judicious combination of the old and new systems. For example, it is not suitable for messages at short distances where there exists a thick net, so to say, of intercommunication, as, for instance, in the field between the units of a brigade or even of a division; though, frequently in these cases, where wires cannot be laid, wireless must be used. Also, where there is such a great accumulation of messages as to delay service, this method aids effectively.

One of the features of its employment from which interesting results are expected after the experiences of this present war, is the mat-

ter of secrecy in transmission of messages.

The receiver of a radio station is affected by all sending stations having a wave length which does not differ greatly from that for which the receiving station is synchronized, provided that such stations are within operating radius. Consequently it is necessary:

First, to provide against molestation and interruption from friendly stations;

Second, to prevent these disturbances from enemy stations;

Third, to preserve secrecy; and

Fourth, to disturb as much as possible the enemy's service.

The first condition is obtained by organization; but the others are not so simply secured.

Above all, training of the personnel is absolutely essential to success, however excellent may be the apparatus.

Several methods are employed for secrecy. The first that occurred to inventive minds was the cipher. By a secret cipher the enemy can be prevented from using the messages, but this does not prevent his interference with transmission. The Horland system is mechanical in its operation in that it translates automatically, both in sending and receiving. Other methods rely principally on synthesis, by which disturbing signals are eliminated. Electrical and mechanical syntheses are used.

The electric method is based on the fact that a carefully tuned transmitter affects only receivers synchronized to the same, or very slightly different, wave length; and this obtains more particularly when the amplitude of the waves is maintained at a maximum. On this account military stations are equipped with carefully tuned transmitters, sending waves of uniform amplitude.

Recent experience has dictated a change of method of synchronization different from that formerly used. The operation of synchronizing a receiver is a matter of a few seconds and is much more quickly accomplished than that of synchronizing the transmitter. It thus results that an enemy receiving station frequently can intercept messages shortly after being set up. Besides, any transmitter whatever of greater power than that from which messages are being received can interfere with the service, since the "zone" of a receiver (equal to the wave length of the transmitter for which it is tuned) is sensible to any more powerful transmitter. From these considerations it is seen that although the adoption of a powerful transmitter, with uniform wave amplitude, does not facilitate one's own communication, it prevents interference.

An apparatus has been advocated for changing the wave length and amplitude, for instance, after every four words; and by use of a commutator different rates of change are effected, the receiver being synchronized automatically for each change.

Fessenden has invented some ingenious devices which the American navy has tested with good results. The transmitter is arranged to reduce inductance in such a way that the wave length varies slightly—according

**WIRELESS TELEGRAPHY**—Continued to the inventor about 25%. (A diagram and detailed explanation follow.—Ed.)

In mechanical synchronization, the principle of mechanical resonance is employed. This is effected by causing the movable parts of the receiver to oscillate with the spark of the sending station. The receiver does not respond to any oscillations other than those in which the succession of waves equals its own rate of oscillation; and by these means weak transmission is more difficult of interruption by the enemy. This method has the inconvenience of slowness, but has the advantage that the direction can be somewhat controlled.

Lastly, there is the method of rapid telegraphy. In important civil and military stations with a large amount of business, where the necessary mechanism can be installed, this method can be applied; but generally field stations cannot be so equipped. With elaborate sending apparatus, of course only receiving stations correspondingly equipped can receive the service. (A general description of instruments invented by Pedersen and Marconi follow.—Ed.)

## WOUNDED

### —Instruction and Training of

[Technical Schools for Maimed Soldiers. L'Ecole Joffre at Lyons. By Thomas Hannan. *Contemporary Review*, July, '16. 3300 words]

The French inaugurated very shortly after the outbreak of the war a movement for the "re-education" of soldiers who have been so maimed as to be unable to resume their former employment. Such a movement must in time be inaugurated in England.

L'Ecole Joffre at Lyons is the model for France, and may well be for Europe. It was organized on the model of the school at Charleroi for those mutilated by accidents in industrial employment.

An old château was procured in which to establish the school at Lyons. The school receives only those who are physically cured but are paralyzed or have suffered amputations, and in either case are to be discharged from the army. Tuberculars and patients suffering from certain other diseases are not received, and alcoholism is to be fought.

The duties to the wounded are: first, to raise them by work; "re-education"; and the Technical School. The first hundred places were soon filled. A second school was opened, and a third is contemplated. Three methods of organization suggested themselves, (1) to make an allowance at home while the wounded soldier learns a trade; (2) for the pupil to live at home or in lodgings and attend the school as a day pupil; and (3) to live in the institution. The last plan was adopted. Careful selection of pupils is essential. They must be completely cured and permanently unfit for military service. Very often men think themselves unable to follow former pursuits when a little training or adaptiveness overcomes the difficulty. The employments listed at L'Ecole Joffre are: bookkeeping, shorthand, and typewriting; paper stitching, pre-

sumably for books; book binding; toy making; shoemaking; woodwork and drawing; tailoring; wood-carving; gardening, and machine adjusting. The course chosen has to be regulated carefully to correspond to the previous education of the pupil. Pupils leaving the institutions are cited as receiving salaries of \$30 to \$40 per month. One trade to be appropriated is that of toy making. Toys have been imported from Germany to an aggregate of 90 per cent. of the consumption, with duty of 2½ million dollars and a probable German profit of half a million.

The school at Lyons receives about 75 cents a day from the Ministry of War for each pupil. Being technically in hospital, the pupils do not receive the 50 cent a day allowance they would receive at home. This allowance was replaced by a somewhat smaller allowance from school funds. The pupils were assured that they would not be deprived of pensions as a result of learning a remunerative trade.

Funds are provided for the school by concerts, etc. The system has taken a great hold in France. Other cities and towns have followed Lyons and Paris. Eleven places are named where such schools are maintained, and others are taking preliminary steps to establish them. There is also a bureau maintained in connection with the schools to find employment for the graduates.

The subject of disabled soldiers is an important one. To enable the country to provide fully for the completely disabled, the partially disabled must largely provide for themselves. One scheme proposed is to give every returned soldier his old employment where possible, and to reserve certain suitable employments for the partially disabled.

### —Work for

[A Re-adaptation of the Work of Maimed and Blind Soldiers. By P. Villey. *Revista Militar* (Portugal), Jan, '16. 7700 words.]

The present war brings forth a multitude of problems, and the one of greatest interest, the one whose results will be passed on to the society of to-morrow, is the utilization of the maimed and blind. Many academic discussions of this question have been presented, and the solution most commonly accepted is a pension system by the state. This is all very well, and it is right that the state should make provision for those who have offered their all in defense of the state; but it does not square the account by any means, for it takes away from the individual the moral satisfaction of an active and useful life.

Of this, some reports, largely documentary, have been presented to the Society of Medicine by Dr. Borne, and to the Academy of Medicine by Dr. Mosny, and more recently on blind soldiers by Dr. Bozy.

The road of execution has actually been entered, however, by the School of Readaptation at Lyons, with other institutions of the same kind. According to Dr. Borne, there are three classes of wounded, viz.: those with curable functional incapacity; the mutilated who can be re-educated; and the permanent invalids. Theoretically, those of the first class will

be cured or incorporated with those of the second class and re-educated. At the beginning of the war, no provision had been made for those of the second class. To-day there should be in each military region establishments where treatments could be given in mechano-therapy and maso-therapy.

The idea will grow that the second class are capable of executing more varied tasks than one is accustomed to observe in France. In Germany, during the nineteenth century, many establishments were founded, in Munich, Stuttgart, Nowawes and Hamburg. The most celebrated establishment of this sort was founded in Copenhagen in 1872, with an investment of over three hundred thousand francs.

A well-organized clinic permits subjecting the candidates for admission to a minute examination, after which only those possessing the physical attributes for entry into the vocational life are accepted. There is a school for children which gives instruction up to the age of 14. An excellent diet is furnished at a minimum price. Institutions similar to the one in Copenhagen were established in Petrograd, and a large number of soldiers were re-educated and trained after the war in Manchuria.

In Belgium there is a school at Charleroi, and in Paris the "Frères de Saint-Jean-de-Dieu, 23, rue Lecourbe," where over 400 maimed and sick receive intellectual and vocational instruction. The numbers that apply for admission are far in excess of the maximum capacity. The principal vocations taught are bookbinding, stitching, and toy making. Success in any of these vocations depends upon the personal equation as in everything else.

In the institution of "Frères de Saint-Jean-de-Dieu," a professor, with both arms amputated and with only stumps left, with artificial arms and hands controlled by pulleys, feeds himself and dresses and makes all arrangements for the day, writes very well, and claims that he is the best sketcher in the house.

The loss of the lower limbs necessarily limits the number of occupations that may be taken up, but there are some that may be followed with success. Dr. Mosny has found by experimentation that some forms of gardening, raising flowers, and aviculture, are well adapted to this class. There are many who have graduated from the school in stenography, bookkeeping, and associated occupations. Many are employed as clerks in hotels, cashiers, secretaries and representatives of commercial houses.

The maimed must be taught the extreme importance of personal hygiene and of exercises to keep the body in health.

Following the excellent example of the school at Lyons, one of the several new schools to be opened under the Minister of the Interior, is the one at S. Maurice, where the character of local opportunities offered to men from different regions is studied, and the maimed are trained in vocations that will enable them to secure employment in their

home territories. One of the most difficult problems encountered in training the maimed is that they feel so keenly their inferiority, so it takes trained instructors and teachers who know how to meet this problem as well as how to teach a trade or vocation.

The state and municipality can and must employ as many as possible in permanent offices. Institutions in which they can be employed must be established. There is one such in Montreuil-sous-Bois founded by Mr. Marsoulan, and one in Paris. They furnish work in such trades as locksmith, bookbinders, and the making of mats and carpets. The originality of these houses is in the distribution of work so that it passes from one to another to completion and even the blind and partly paralyzed are furnished employment. The Municipal Council of Paris employs almost 500 maimed.

In the establishments where wounded and maimed are employed, there will be a deficiency in receipts as against expenditures. This is the case in Paris. This deficiency is met in part by the municipal government and in part by the national government. But it keeps those who otherwise would be pensioners usefully employed, and reduces the pension list. If a pension is paid and no service rendered, it amounts to about the same as the salary aid for services rendered. By employing those who can render service in municipal and government clerkships, it will mean an economy of about 75 per cent. The pension should be subordinated to the condition of the individual, and if he is capable of rendering service he must be required to do so. With a pension and nothing to do, men soon deteriorate into alcoholics and drug users—both of which the maimed must be protected against with all diligence.

With reference to the blind there are available no statistics at present, but it is certain that the percentage of blind is greater than in any previous war. This is due principally to the methods employed in combat. Most of the fighting is trench-fighting, in which the body is well protected and the head the only part exposed. The pension provided for the blind is, for the loss of one eye 600 francs, and for the loss of both eyes 975 francs, which is out of all proportion. With the loss of one eye the man's capacity for work is but little impaired and his social standing is not interfered with, but with the loss of both eyes his earning capacity is almost gone and he becomes something of a social burden. With the loss of both eyes the man is compelled to give up the profession or trade in which he has been trained, which is not true in case of the loss of one eye.

The laws governing pensions for blind are old and inadequate. There are 50 cases of the loss of one eye to one with the loss of both eyes.

Much tact and patience are necessary in training the blind, and teaching them new ways of amusement and means of passing the time. Seldom does one admit to himself that he is hopelessly blind, and they cling to the hope

**WOUNDED—Continued**

that their sight will return even after they have been pronounced hopeless. The reaction when they first learn that their affliction is permanent is something that must be guarded against most carefully. Some meet the condition with obstinacy, some with resignation, and some philosophically. The main thing is to get them busy and keep them busy.

After 20, and more particularly after 30, it is too late to begin the study of music without the use of the sight. It is necessary then that teaching the blind cannot be begun too early. They may be taught to make brushes, to reseat chairs, and a number of other things.

Dr. Fabre has demonstrated that one of the best occupations for the blind is that of masseur. There are many points on which they would have to be educated, and some natural aptitude would have to be present. They would have to have reasonably good health, possess suave manners, tact, and a thorough knowledge of the profession, as well as the ability to converse well and agreeably.

"The Society of the Friends of Blind Soldiers" has been founded for some months and its work is of an auxiliary nature and is devoted entirely to those who have lost their sight in the war. Some of the inactive organizations are deserving of the deepest gratitude, notably the "Franco-American Committee for the Blind of the War."

[Wounded Men as Bridegrooms. Notes from a lecture by Dr. Murray Leslie. *The Canadian Military Gazette*, May 23, '16. 400 words.]

The British casualties in the present war up to Feb 1, 1916, were 550,000, and for every thousand deaths there are 200 cases of permanent disability.

It is proposed to found a League for the Marrying of Wounded Heroes. The purpose of this league is to encourage admiration for wounded soldiers, and also to overcome the aversion which woman, as a sex, has to all kinds of deformities. The mere fact that a man is a cripple or even deformed does not detract in any way from his potentialities as one of the fathers of the future generation, for the curious but widely spread belief that deformities are inherited is untrue.

[Radio Communications. Blind French Soldiers for Operators. *Scientific American*, Sept 23, '16. 175 words.]

Looking ahead for employment for blinded soldiers, French scientists believe that such men will make good wireless operators, as they develop acute senses of hearing and touch.

**WOUNDS**

See also

HELMETS—ARMORED  
WOUNDED

**WRIGHT AEROPLANE**

[New Wright Tractor. *Aerial Age Weekly*, July 10, '16. 1500 words. Two illustrations.]

The new Wright tractor has a speed of 80 miles per hour, with a 60-h. p. motor. It has

flaps instead of wing warping, and a wheel control. The principal dimensions are: span, 29 feet; length, 24 ft.; weight, 850 lbs.; climb, 650 ft. per min.; area of main planes, 375 sq. ft.

**ZEISS RANGE FINDER**

[Errors and their Causes Affecting the Accuracy of Self-Contained Range Finders. By von Happach, German Goedetic Survey, now Sergeant Major in an Anti-Aircraft Battery. *Artill. Monatshefte*, Dec, '15. 3200 words. Illus.]

The instrument considered is the Zeiss Range Finder, 18 power, 1.25 m. base. It belongs to the system known as the upper invert. The measurement of the range is made by the observation and the simultaneous solution of the triangle in which the base and one angle are fixed and the other angle is variable. Calling this variable angle  $\alpha$ , then the divisions on the range drum can be calculated by the equation—

$$\delta x = B \tan \alpha \dots\dots\dots (\text{Eq. 1})$$

in which:

$\delta$  = range;

$B$  = length of the base of the instrument. An error  $\Delta \alpha$  in the measured angle will produce a corresponding error in the range

$$\Delta \delta = \frac{\delta^2 \Delta \alpha}{B \sin^2 \alpha} \dots\dots\dots \text{Eq. (2).}$$

This error may be determined by repeated measurements of the same range. For the Zeiss range finder it is  $\Delta \alpha = \pm 0.55''$ , an accuracy which is found in the best theodolites only. This mean error in range  $\Delta \delta$  is given in tabular form and varies from 2.2 m. at 1000 m. to 106 m. at 7000 m. and 485 m. at 15,000 m.

The error  $\Delta \alpha$  is composed of several smaller errors which may be investigated. For instance the visual error in obtaining coincidences designated  $E$ , can be determined when  $\Delta \alpha$  and the power of the instrument are known from the equation  $E = V \Delta \alpha$ , variable but equal to approximately 10 seconds, from which we have for all instruments necessitating the making of coincidences

$$\Delta \alpha = \frac{10''}{V} \quad \text{Substituting in equation}$$

$$(2) \text{ we have } \Delta \delta = \frac{\delta^2}{VB \sin^2 \alpha} \dots\dots\dots$$

In addition to these probable errors, there are also certain constant errors resulting from conditions in the instrument which will always cause a fixed variation from the true range, that is, the ranges will read always too great or always too small. These absolute errors are compensated for by an adjusting device which can be easily applied.

There are other errors which are not dependent upon construction of the instrument, but upon its use and the personal error of the observer. Such for instance are the effect of the sun's rays when shining on the side of the instrument only, or sudden changes in temperature.

**"ZEPPELINS"**

See

DIRIGIBLES—GERMANY











